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I N T E R N A T I O N A L

Paris

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B U L L E T I N D ' I N F O R M A T I O N

Novembre 1966

N°14

T A B L E des M A T I E R E S

Bul. n°14

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N O T I C E S N E C R O L O G I Q U E S

Prof. em. Dr. phil. OTTO MEISSER
(1898-1966)

Ehrensenator der Bergakademie
Hervorragender Wissenschaftler des Volkes
Träger des Vaterländischen Verdienstordens in Silber
Ordentliches Mitglied der Deutschen Akademie der Wissenschaften zu Berlin
Mitglied des Forschungsrates der Deutschen Demokratischen Republik
Ehrenmitglied der Gesellschaft Deutscher Berg- und Hüttenleute
sowie der Gesellschaft Ungarischer Geophysiker

am 13. Juli 1966 im 68 Lebensjahr verstorben ist.

"Mit dem Tolde von Otto MEISSER hat die Bergakademie Freiberg einen verantwortungsbewussten Hochschullehrer und einen ausgezeichneten Wissenschaftler verloren. Mit unermüdlicher Schaffenskraft hat er in mehr als 43 jähriger beruflicher Tätigkeit wessentlich zur Entwicklung der Angewandten Geophysik über alle Landesgrenzen hinweg beigetragen.

Als Schüler von Max Wien erwarb sich Otto MEISSER erste Verdienste um die Entwicklung einer Forschungsabteilung für Angewandte Geophysik an der damaligen Reichsanstalt für Erdbeben-Forschung, Jena, dem später auch von ihm geleiteten Institut für Geodynamik der Deutschen Akademie der Wissenschaften zu Berlin, Forschungsgemeinschaft. 1940 wurde er als Professor und Direktor des neugeschaffenen ersten Instituts für Angewandte Geophysik in Deutschland an die Bergakademie Freiberg berufen, an der er bis 1946 wirkte. Nach mehrjähriger verantwortungsvoller Tätigkeit im Ausland kehrte Otto MEISSER 1951 an die Bergakademie zurück und entwickelte in kurzer Zeit unter selbstlosem Einsatz die Geophysik in Lehre, Forschung und Praxis, und zwar betont für die volkswirtschaftlichen Belange der Deutschen Demokratischen Republik.

Als Mitglied des Senats der Bergakademie und als Rektor in der Zeit von 1955 bis 1957 trug er wessentlich mit dazu bei, das wissenschaftliche Ansehen der Bergakademie als montanwissenschaftliches Zentrum weit über die Grenzen der Deutschen Demokratischen Republik hinaus zu erweitern und zu festigen. Als Vorsitzender, als Mitglied und als Initiator zahlreicher wissenschaftlicher Gremien war Otto MEISSER ein international anerkannter Wissenschaftler. In seiner Lebenshaltung, seiner Einstellung zur Arbeit seiner Liebe zur Wissenschaft und in sein Tatkraft war er seinen Fachkollegen, Mitarbeitern und Studenten ein ständiges Vorbild".

K.F. LUDEMANN
Rektor der Bergakademie

Professeur Dr. F.A. VENING MEINESZ

(1887-1966)

"Le 10 Août 1966 mourut à l'hopital "De Lichtenberg" à Amersfoort Félix Andries VENING MEINESZ, ancien professeur extraordinaire de l'Université d'Utrecht et de l'Ecole Technique Supérieure de Delft.

Voici retracée la vie de ce savant qui, dans le domaine de la gravimétrie et de son application à la géodésie et la géophysique a d'une part, accompli un travail de pionnier et d'autre part, servi la science en exerçant des fonctions importantes dans le domaine de l'organisation au niveau national et international.

F.A. VENING MEINESZ naquit le 30 Juillet 1887 à Scheveningue. Il fit ses études à l'Ecole Supérieure Technique de Delft, de 1905 à 1910, où il obtint le diplôme d'ingénieur hydraulicien. En début de carrière, il fut chargé d'effectuer des opérations gravimétriques et s'aperçut que les mouvements violents et irréguliers du sol instable des Pays-Bas perturbaient considérablement les observations du pendule. Le résultat de ces études sur les perturbations fut l'objet de sa thèse "Contribution à la théorie des observations de pendule", présentée en 1915 et qui lui valut le titre de docteur avec la mention "cum laude" : il y exposait, en particulier, une nouvelle méthode dite des deux pendules, qui consistait à faire osciller deux pendules à amplitude égale et à phase contraire sur un seul support et dans le même plan d'oscillation.

Puis, il se pencha sur le problème des mesures de pesanteur en mer et constata qu'il n'était pas possible de faire en sorte que les amplitudes soient égales et les phases opposées sur un bâteau de surface, ni d'ailleurs dans un sous-marin en plongée. Il eut alors une idée géniale : il pensa que, indépendamment de l'amplitude et de la phase des pendules, la différence entre les angles d'élongation des deux pendules était insensible aux plus grandes accélérations horizontales et que l'angle que constituait cette différence pourrait être considéré comme un angle d'élongation d'un pendule fictif ayant la même période que les pendules existants. Il expérimenta sa méthode au cours de nombreuses croisières en sous-marin, en particulier, à Java soit, par le canal de Panama soit, par Buenos-Aires, le Cap et Perth. Les résultats de ses expéditions (environ 1.000 stations gravimétriques) furent publiés dans : "Gravity expeditions at sea" tome I, II, III, et IV.

Parallèlement, il se pencha sur l'analyse des observations qu'il avait faites. Ses recherches en géodésie sont relatées dans la publication bien connue : "A formula expressing the deflection of the plumbline in the gravity field and gravity potential outside the geoid.

En tant que géophysicien F.A. VENING MEINESZ se servit de ses observations pour étudier la croûte terrestre rigide. Il prit le principe de l'isostasie, l'équilibre hydrostatique de la croûte terrestre et de la masse plus lourde du manteau sous-jacent, principe qui fut confirmé par ses opérations gravimétriques. Pour une meilleure interprétation gravimétrique, il calcula des tables de corrections isostatiques dans le cas d'une compensation régionale (tables for regional and local isostatic reduction, Airy System, for gravity values).

Cependant, pour les territoires où la gravité présentait de grandes déviations et où il y avait de grandes anomalies isostatiques, F.A. VENING MEINESZ tenta de trouver une explication de ces faits : sa découverte de zones ayant de fortes anomalies négatives à l'extérieur de l'arc des îles de l'archipel des Indes Orientales selon lui, ces anomalies trouvaient leur origine dans une forte pression à l'intérieur de la croûte terrestre, qui fit pénétrer celle-ci dans le manteau pourtant plus lourd.

Après la Seconde Guerre Mondiale, il continua ses travaux d'interprétation. Ses théories sur les courants terrestres de convexion dans le manteau de la Terre par lesquels il expliqua les mouvements de la croûte terrestre ont acquis une réputation considérable. En 1957, il pris sa retraite mais ne cessa pas pour autant d'écrire et publia avec le Professeur HEISKANEN "The Earth and its gravity field" (1958) et "The Earth's crust and mantle" (1964).

F.A. VENING MEINESZ a occupé une place importante au sein des organisations dans le domaine de la géodésie et de la géophysique. Pendant de longues années il fut Président de la Commission Géodésique Néerlandaise ; de 1933 à 1955, Président de l'Association Internationale de Géodésie ; de 1948 à 1951, Président de l'Union Internationale de Géodésie et de Géophysique.

Le Professeur P. TARDI a retracé les différentes activités du Professeur VENING MEINESZ en tant que Président de l'Association Internationle de Géodésie, dans le "Gedenkboek" (1957), publié à propos de son 70ème anniversaire.

Sur le plan national ainsi que sur le plan international, son oeuvre scientifique a été appréciée à sa juste valeur. En 1928 il fut nommé membre de l'Académie royale des Sciences, il fut docteur honoris causa de nombreuses universités à l'étranger et membre de plusieurs Académies des Sciences".

D'après le Prof. Dr. G.J. BRUINS

I N F O R M A T I O N S

MESURE ABSOLUE DE g

1°) ABSOLUTE VALUE of g at the NATIONAL BUREAU of STANDARDS

"The National Bureau of Standards has recently completed a determination of the acceleration due to gravity at its new facility near Gaithersburg, Md. The measurements were made in the Engineering Mechanics Building during the months of April, May and June of 1965.

The determination was derived from observations of the increase in speed of a one-meter fused silica tube falling freely within a vacuum chamber which was itself falling with approximately the acceleration due to gravity. The measurements included data from four different fused silica tubes yielding a total of 36 sets of observations. Each set was normally composed of 16 independent free-fall observations. There were no statistically significant differences among the results for the four tubes, the observed variations being well within that expected on the basis of the standard deviation of $1,4 \times 10^{-5} m/s^2$ found for individual sets of observations.

The determination was made in Room 129 of Building 202 at the National Bureau of Standards.

The absolute determination was made 30 cm east and 26,3 cm above the point marked NBS - 1. The absolute value was reduced to the reference point NBS - 2 on the floor of the room by gravity meter connections made by the U.S. Coast and Geodetic Survey during October 1965. These connections are included in the report to Special Study Group N° 5.(a)

(a) These data are available from the files of the U.S. Coast and Geodetic Survey.

The determination resulted in an absolute value of gravity for NBS-2 of :

$$g = 9.801018 \text{ meters/second}^2.$$

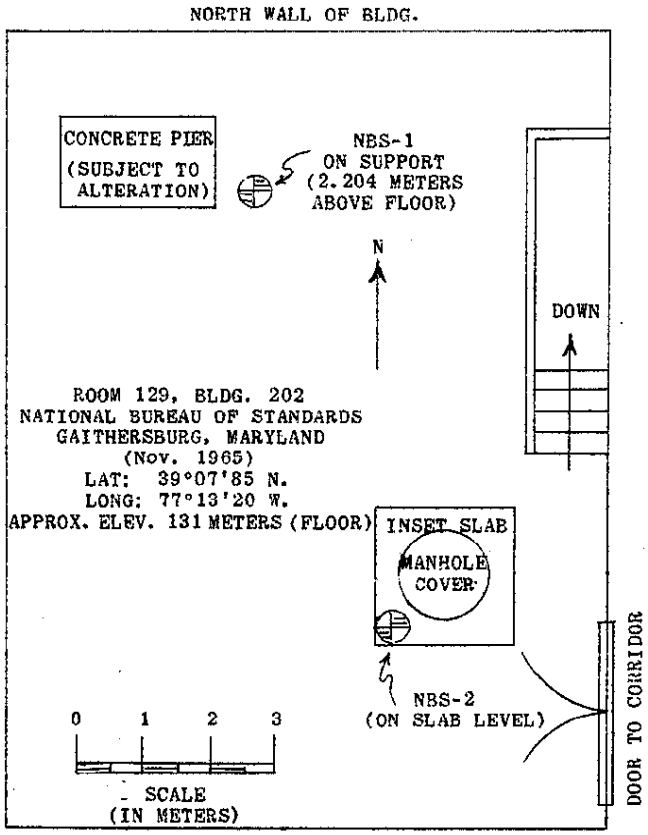

FIGURE 1. *Gravity stations at the National Bureau of Standards*

The standard deviation of this value based on statistical variation but not including systematic error was less than $0.3 \times 10^{-5} m/s^2$.

The point NBS-2 has a value of 9.801150 m/s^2 obtained by gravity meter connections based on a Potsdam value of 9.80118 m/s^2 for the national gravity base in the Department of Commerce Building in Washington, D.C. The absolute value is therefore $13.2 \times 10^{-5} m/s^2$ (13.2 milligals) less than the Potsdam value for NBS-2.

A complete description of the experimental procedure will be given in a forthcoming publication".

Dr. R. TATE

(J. Res. v.70C, p.149. 1966)

2°) MESURE ABSOLUE de la PESANTEUR au BUREAU INTERNATIONAL des POIDS & MESURES

"La mise au point de l'ensemble des appareillages (Fig. 1) est quasiment achevée depuis le début de l'année 1966. (a)

Depuis, on a poursuivi l'expérience de la détection des moments de passage du trièdre lancé aux deux stations distantes verticalement de 40 cm environ, cet intervalle étant mesuré avec une précision relative de 1×10^{-8}. Cette détection se fait par photographie des quatre groupes de franges achromatiques interférentielles en lumière blanche. Cette opération a été techniquement difficile à réaliser pour les raisons suivantes:

1 - La grande vitesse du trièdre : 3,0 m/s à la station basse, la durée d'une frange n'étant alors que 35 ns,

2 - La faible étendue géométrique des faisceaux lumineux qui doivent être rigoureusement parallèles,

3 - La petitesse de la surface utilisée des miroirs (0,2 cm^2)

Mais grâce à l'emploi d'une source extrêmement brillante on a réussi à obtenir ces photographies de franges d'une façon satisfaisante avec un rapport signal/bruit supérieur à 30 dB. Cette source est une lampe au xénon donnant des flashes dont le flux lumineux est environ 1×10^9 lumens, déclenchés par prédétection juste au moment du passage du trièdre à chaque station.

D'autre part, il s'est avéré que le temps du vol du trièdre (0,6s environ) peut être mesuré avec une incertitude inférieure à 2 ns.

Ainsi la première mesure préliminaire de g a été faite récemment et cette valeur provisoire de g à Sèvres Point A est concordante, à 2 mGal près, avec celle de A. **THULIN** obtenue en 1959 au même endroit. (b)

Cette première expérience a confirmé la nécessité de terminer plusieurs dispositifs annexes pour obtenir la précision ultime permise par la méthode qui est meilleure que 0,1 mGal. Par exemple, une meilleure stabilisation de la température ambiante est en cours d'installation ainsi que la protection de la table stabilisée (Fig. 1) contre les vibrations acoustiques ; un microséismomètre interférentiel permettant de mesurer les vibrations résiduelles de cette table stabilisée vient d'être installé. Nous sommes en train de mettre en oeuvre les moyens les plus efficaces pour neutraliser les sources, même minimes, de vibrations sonores ou mécaniques comme, par exemple, la caméra, les déclencheurs, les masques pivotants.

Nous prévoyons qu'en 1967 une valeur provisoire de g sera obtenue avec une incertitude inférieure à 0,1 mGal".

A. SAKUMA

(a) Voir ét. préliminaires dans Bull. Géod. n°69, p.249 (1963).
(b) THULIN A. : Thèses, sér. A, n°874, Gauthier-Villars, Paris (1961).

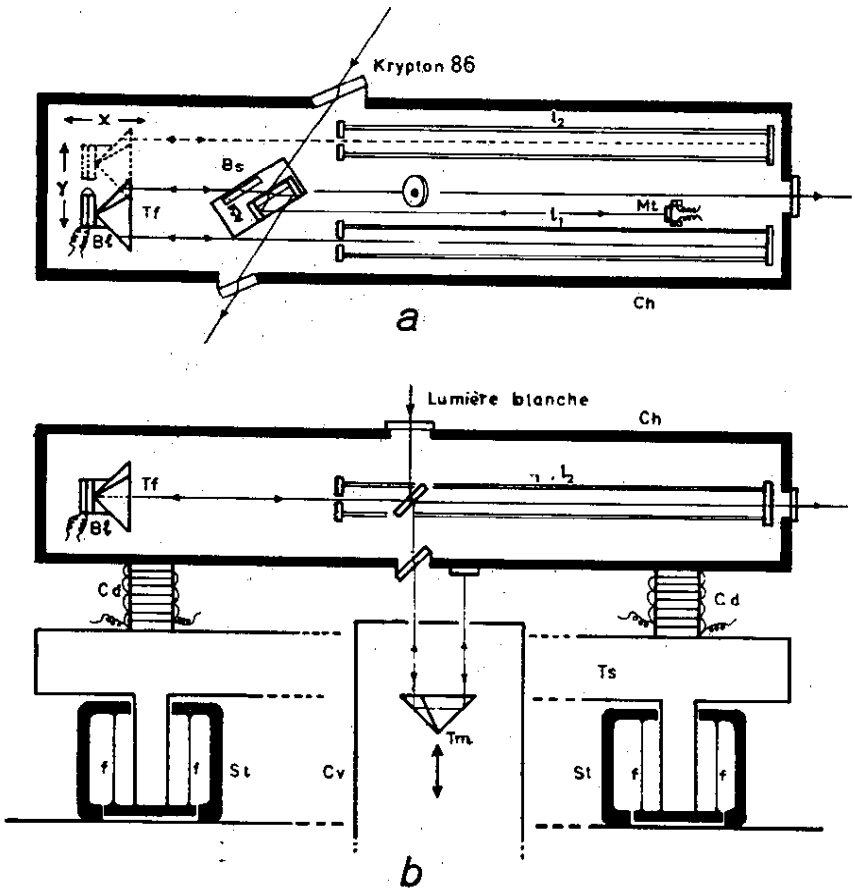

Fig. 10 *a* et *b*. — Schéma de l'appareillage interférométrique dans son caisson à vide pour la mesure absolue de *g*.
a, Vue en plan; *b*, Vue en élévation.

Bl, Bilame piézo-électrique;
Bs, Bloc pivotant de la séparatrice-compensatrice de l'interféromètre horizontal;
Cd, Crapaudine déformable piézo-électrique;
Ch, Caisson à vide horizontal;
Cv, Caisson à vide vertical;
f, Fils de suspension de la table stabilisée *Ts*;
l_1, l_2, Étalons de longueur tubulaires en silice fondue;
Mt, Miroir terminal de l'interféromètre, supporté par des pieds piézo-électriques;
St, Support anti-vibratoire destiné à l'amortissement des accélérations horizontales;
Tf, Trièdre fixe;
Tm, Trièdre mobile;
Ts, Table stabilisée contre les vibrations.

MESURES EN MER

A) CARTE RECAPITULATIVE DES MESURES DE PESANTEUR EN MER

(Index sheet of open sea gravity measurements)

Le B.G.I. a établi une carte d'ensemble des travaux gravimétriques en mer à partir d'un fond de carte publiée par l'Admiralty, London (Index of plotting Areas n°5330; equatorial scale : 1/36.000.000°) ; cette carte a été placée à la fin du Bulletin sous une forme réduite.

Sur cette carte on a reporté :

- les mesures pendulaires en sous-marin,
- les mesures au gravimètre sur bateau de surface (y compris les mesures près des côtes, dans les océans).

Pour ne pas surcharger l'impression on a omis :

- les mesures de pesanteur effectuées dans les mers intérieures (Méditerranée, Skagerrak, Baltique...)
- et les mesures effectuées avec des gravimètres posés sur le fond ("underwater gravity meter").

Dans cette première édition, il n'a pas été possible de numéroter les tracés suivant les différentes expéditions. On s'est contenté de différencier les emplacements des mesures pendulaires et les profils continus des mesures au gravimètre, suivant la Nation (ou le grand Service) qui a effectué les campagnes. Dans le cas où plusieurs Nations ont participé à la même croisière, on a conservé la différenciation de l'organisme principal, mais la participation des autres Services a été indiqué dans le texte.

Le tableau récapitulatif des travaux effectués dans chaque Océan permettra d'identifier plus facilement le tracé des profils gravimétriques (p.11-13).

Les travaux reportés sur cette carte proviennent soit de publications soit d'informations récentes qu'ont bien voulu nous communiquer les gravimétristes, à la suite de la circulaire que le B.G.I. leur avait envoyée.

Comme ces publications ont déjà été classées dans les Bulletins d'Information du B.G.I. sous la rubrique "Mesures en Mer", on n'a pas répété dans le texte ci-après les références bibliographiques ; on a seulement désigné les publications par leur numéro d'indexation dans les Bulletins.

A T L A N T I C O C E A N

(List of surface ship gravity tracks)

Gravity traverses	Organizations	References
Norway - Greenland (65°N) (1965)	—.—.—.— G.B.	G.E. MURT (1966)
Denmark - Greenland (60°N) (1965)	—.—.—.— Denmark	Pub. n°137
Canada - Greenland - Hudson Bay. (1965)	---------- Canada	B.D. LONCAREVIC (1966)
North Atlantic (44°-47°N) Mid-Atlantic Ridge (1960, 1965)	---------- Canada	Nat. Rep. IGC 1965. Pub. n°166.
G.B. - USA - Antilles (1965)	—.—.—.— G.B.	G.E. MURT (1966)
Atlantic Ocean (55°-22°N) NAVADO III (1964-65)	+++++++++ Nether.	Pub. n°168
Atlantic Ocean (19°-10°N) (1963-64)	—.—.—.— G.B.	G.E. MURT (1966)
Mid-Atlantic Ridge (NW-SE) (1958, 1963-65)	——— USA (Lamont)	Pub. n°102, 175
W. Africa - Panama (1962-63)	——— USA (UCLA)	Pub. n°86
Gibraltar - Falkland Islands Antarctic (1965-66)	—..—..— G.B. Birmingham	F.J. DAVEY (1966)
Gibraltar - Ascension Island The Cape (1965-66)		
West Coast South Africa	—.—.—.— G.B.	G.E. MURT (1966)

(Atlantic Ocean)		
Gulf of Mexico (1960-61)	——— USA (Texas)	Pub. n°108
G.B.- N.W.Spain - W.Gibraltar (1960, 1961-62, 1964, 65, 66)	—.—.—.— G.B.	G.A. DAY (1966)
North of Surinam (1966)	+++++++ Nether.	W. LANGERAAR (1966)

INDIAN OCEAN

Aden - India - Mauritius Isl. (Owen 1961-62)	—.—.—.— G.B.	Pub. n°98
Aden - India - Seychelles... (Owen 1962-63)	—.—.—.— G.B.	G.A. DAY (1966)
Japan - Indonesia - Australia (Int. Ind. Oc. Exp. 1963-64)	////////// Japan	Nat. Rep. IGC 1965.
Timor Sea, N. Australia (1965)	Australia	L.S. PRIOR (1966)
Perth Basin, W. Australia (1960-62-64/65)	Australia	L.S. PRIOR (1966)
(California) Indonesia - The Cape... Australia.. (1960-63)	——— USA (UCLA)	Pub. n°86
(California) Indonesia - Ceylan... (1963-64)	- - - - USA (CGS)	Pub. n°180

P A C I F I C O C E A N

Gravity traverses	Organizations	References
Chukchi Sea (70°N-170°W) (1965)	= = = = USA (CGS)	H. ORLIN (1966)
Aleutian Trench (N.- S.) (1965)	= = = = USA (CGS)	H. ORLIN (1966)
Aleutian -Islands area (1965	= = = = USA (CGS)	H. ORLIN (1966)
Off the California Coast (Mendocino Escarpment) (1964-65)	= = = = USA (CGS)	H. ORLIN (1966)
W. Coast of N. America (British Columbia) (1965)	_ _ _ _ USA (CGS)	Pub. n°112
California - Honolulu - Indonesia - Ceylan (Ind. Oc. Exp. 1963-64)	_ _ _ _ USA (CGS)	Pub. n°180
California - Indonesia... India - Seychelles - The Cape Australia - Honolulu... (1960-63)	_____ USA (UCLA)	Pub. n°86
Borderland Area off California Gulf of California (1958-59)	_____ USA (UCLA)	Pub. n°87, 91...95, 97.

Les numéros des publications correspondent aux numéros d'indexation des Bulletins d'Information.

- n° 1 - 37, Bul. Inf. mai 1960
- n° 38 - 52, Bul. Inf. avril 1962
- n° 53 -108, Bul. Inf. février 1965 (n°8)
- n°109 -186, Bul. Inf. novembre 1966 (n°14)

Les principales informations relatives aux travaux de ces dernières années (1963-66) ont été rappelées ci-dessous.

B) PRINCIPALES DETERMINATIONS DE g EN MER (1963-66)

ARGENTINE

L'Institut de Géodésie de l'Université Nationale de Buenos-Aires en collaboration avec le Service Hydrographique du Secrétariat de la Marine ont poursuivi l'étude gravimétrique de la plateforme sous-marine à l'aide d'un gravimètre télécommandé "North American"

- en 1963, observations entre Buenos-Aires et Mar del Plata (38°S)
- en 1964, série de déterminations sur le fond du Rio de la Plata
- en 1965, observations à partir de Mar del Plata jusqu'à Bahia Blanca (39°S — 57°-62°W.G.).

La liste des données des stations en mer ainsi que les monographies des stations de référence ont été envoyées au B.G.I.

(E. BAGLIETTO, 11.1966)

AUSTRALIE

a) Perth Basin, Western Australia

The marine geophysical investigations in the area of the Perth Basin, were made on the Vema (1960), Vema 18 (1962) and Conrad 8 (1964) by the following groups :

- Bureau of Mineral Resources, Australia
- University of New South Wales, Kensington, Australia
- Royal Navy Australian
- Lamont Geological Observatory of Columbia University.

The gravity observations were obtained with Graf-Askania surface ship gravimeter. (Bul. Inf. n°155).

b) Timor Sea, North Australia

The Bureau of Mineral Resources made a gravity survey off Wyndham in the Timor Sea, north of Australia in 1965, using a LaCoste-Romberg surface ship gravity meter. This work was associated with magnetic and seismic "sparker" profiling. Observations were controlled by an underwater gravity meter.

This work will be continued during the next few years but, for the time being, it is restricted to the continental shelf areas.

(Publications B.M.R. Aust. Records 1966/72 and 1966/116)

Note : The B.M.R. and the royal Navy took part in the pendulum observations cruise in the submarine H.M.S. Telemachus in the Southwest Pacific Ocean on a track from Sydney, Australia to Wellington and Auckland (1956) by the Lamont Geological Observatory.

(B.M.R. Austr. Records 1963/42, 1963/43)

c) Saint-Vincent's Gulf, South Australia

A gravity survey of St-Vincent's Gulf, South Australia, was made by Beach Petroleum N.L. (Sprigg & Stackler, 1965). A normal land gravity meter and an observer in a diving bell were lowered to the sea bottom to depths of up to 150 feet. Positions were surveyed by theodolite from the shore. The accuracy of the survey approached that of land surveys.

(J.C. DOOLEY, Nat. Rep. IGC. 1965)
(L.S. PRIOR, 10.1966)

CANADA

a) In 1963 a range for testing surface ship gravimeter was established 60 miles southeast of Halifax in an area approximately 30 miles square (A.K. GOODACRE, 1964, Bul. Inf. , n°152). In the fall of 1963 the Dominion Observatory and the Bedford Institute of Oceanography conducted a series of comprehensive tests on a LaCoste and Romberg and on a Graf-Askania surface ship gravimeter simultaneously over this range. (108 runs completed on Halifax Test Range).

b) In the fall of 1964 underwater gravimeter measurements were made in Lake Superior from the C.G.S. PORTE DAUPHINE.

c) In 1965 an extensive survey of Hudson Bay was carried out with the M.V. THERON equipped with an underwater gravimeter and the C.S.S. HUDSON equipped with both an underwater gravimeter and a Graf-Askania surface gravimeter.

d) In 1964 evaluation of the Graf-Askania sea gravimeter was continued by Bedford Institute and some 6.000 line miles of reconnaissance surveys were completed : 500 miles in the Cabot Strait and Gulf of St-Lawrence, 3.500 miles off the Nova Scotia continental shelf and about 2.000 miles in the Bay of Fundy.

The instrument operated continously on a cruise to England early in 1965 in North Atlantic (along 44°, 45° et 47°N). During this cruise, a section of the Mid-Atlantic ridge was studied intensively.

Reconnaissance survey of the western approaches to the English Channel revealed parallel belts of negative anomalies associated with an extension of Devon granites and Frais Crag granites.

(M.J.S. INNES, Nat. Rep. IGC. 1965)

Concerning the recent tracks in North Atlantic, the data reports are now in preparation...

(B.D. LONCAREVIC, 11.1966)

DANEMARK - North Atlantic profile (along 60°N)

In 1965 the Royal Geodetic Institute of Copenhagen in collaboration with the Royal Danish Hydrographic Office carried out gravity measurements on the inspection ship "Hvidbjørnen" from Denmark to Greenland.

The determination of the geographical positions in the North Sea is based on Decca-navigation and in the Atlantic Ocean based on Loran A navigation.

The data have not yet been published, but the list has been communicated at the Int. Grav. Bur. (Bul. Inf., n°137).

ETATS-UNIS

Employing gimbal-suspended meters of the LaCoste-Romberg type, the USC&GS Ships PIONEER and SURVEYOR measured gravity on north-south oceanographic track lines between Hawaii and the Aleutian Islands, over the Aleutian Trench, and along profiles near the Hawaiian Islands.

Gravity measurements were taken on the PIONEER during the Indian Ocean Expedition in 1963-64. (Bul. Inf., n°180s et 180b).

(D.A. RICE, Nat. Rep. IGC. 1965)

The Indian Ocean data will appear shortly in Volume 3 of the International Indian Ocean Expedition.

(H. ORLIN, 10.1966)

Measurements on the SURVEYOR at oceanographic stations in the Aleutian Islands area were accomplished in the latter part of 1964 following her special assignment to Alaskan waters in connection with earthquake damage surveys. Early in 1965 both ships resumed operations over north-south oceanographic tracks north of Hawaii.

The LaCoste-Romberg sea gravity meters employed have shown output errors of normally less than ± 5 mGal when the amplitudes of vertical and horizontal acceleration do not exceed 40,000 mGal. Errors between ± 10 and ± 20 mGal are experienced when the accelerations are in the range 40,000 to 100,000 mGal. Two new LaCoste-Romberg sea meters, modified for operation on stable platforms, were tested on the evaluation rage off San Francisco in May 1965. The results were unsatisfactory, apparently due to inability of the plateforms to maintain vertical reference. A gravity laboratory was established in 1965 by the USC&GS near Washington, D.C. primarily for testing operation of meters on moving platforms.

The present complement of gravity instruments at the U.S. Naval Oceanographic Office includes seven air-sea and two underwater meters. NAVOCEANO has an active interest in cooperative surveys with universities. In the fall of 1964 a sea gravity survey of the Solomon Islands, with the University of Hawaii, was conducted. In the summer of 1965 a joint effort with the Univ. of Wisconsin and the U.S. Army was made to survey Lake Superior with an underwater and sea-surface meter.

The Lamont group under J.L. WORZEL obtained continous gravity measurements aboard the R/V VEMA and R/V R.D. CONRAD for about ten months each year in 1963, 1964 and 1965 to cover about 200,000 miles of track. The coverage includes several crossings of deep sea trenches (Java, Marianas, Philippine, Japan, Aleutian, and Peru-Chile), several crossings of mid-ocean ridges (North and South Mid-Atlantic, Mid-Indian, and the East Pacific Rise), as well as detailed coverage of the Caribbean Sea.

Free-air and simple Bouguer anomalies were computed and all the data reduced by the end of 1965. (See some results in publications : Bul. Inf., n°101, 118, 175 and 181).

For a damped beam gravity meter such as the Askania-Graf GSS2 mounted on a stable platform the importance of cross-coupling and off-leveling errors has been pointed out in the literature. Lamont studies based on analysis of acceleration as well as stable platform off-leveling records showed that the cross-coupling error could be appreciable under normal sea conditions while the off-leveling error was generally negligible for the Askania-Graf GSS2 meter. An analog cross coupling computer has been constructed which records the errors continuously.

The Oregon State Univ. group under P. DEHLINGER operated LaCoste-Romberg gimbal-suspended meter S-9 on several marine gravity surveys during 1964 and 1965. Accuracies were in the range ± 7 to ± 10 mGal, including navigation. An area was surveyed off the Oregon coast seaward about 300 miles. Twelve north-south traverses, each about 80 miles long, were measured across the Mendocino Escarpment off the California coast. Operating aboard the USC&GS Ship SURVEYOR in 1964, the OREGON meter measured across the Hawaiian Archipelago and in the North Pacific...

establishing north-south profiles at 10 mile spacing. In 1965 operations were continued off the west coast of North America, extending seaward about 300 miles and from the Columbia River to Queen Charlotte Sound, British Columbia. (See Bul. inf. , n°112 and 145).

During the past three years the Marine Gravity Project of the UCLA group under L.B. SLICHTER operated a LaCoste-Romberg surface-ship gravity meter in collaboration with the Scripps Institution of Oceanography on several cruises in the Pacific, Atlantic, and Indian Oceans.(*)

A 1963 study of sea gravity meter accuracy indicated that 80% of 231 track crossings in the California borderland agreed within 10 mGal, elimination of crossings with large sounding discrepancies produced 7 mGal or less discrepancies in 80% of the cases. With recent improvements in instrumentation, the last cruise in the California borderland gave agreements within 5 mGal for 85% of the track crossings. Overall evidence indicates that about 80% of the UCLA sea gravity data are within 10 mGal of the true value.

Since July 1963 the Geophysics Department of the Woods Hole Oceanographic Institution has obtained gravity measurements aboard the R/V CHAIN for about 77,000 miles of track. Detailed studies have been made of the Puerto Rico Trench and the Barracuda Ridge and Scarp east of Antigua. Other projects were completed in the Greater and Lesser Antilles, Mid-Atlantic Ridge, the Mediterranean, and the Mascarene Ridge in the western Indian Ocean. Data from these cruises were reduced to free-air and sea Bouguer anomalies by a shipboard data processing system. This system samples, records, and reduces gravity and other geophysical information along with navigational control data.

Free-air and sea Bouguer anomaly charts have been completed for an area of 100,000 square miles north of Puerto Rico, including the Trench and Outer Ridge. Other nearly completed charts include the Barracuda Ridge, a portion of the Ligurian Sea, an area off the coast of Lebanon and three small areas on the Mid-Atlantic Ridge at 23°N, 43°N and 45°N.

(D.RICE, Nat. Rep. IGC. 1965)

(*) Note : In respect to the Java-Sumatra trench area several thousand readings in this area are being presented as free-air and Bouguer anomaly maps, making use of the most recent bathymetric data from Dr. R. FISHER at La Jolla.

(L.B. SLICHTER, 10.1966)

GRANDE BRETAGNE

The Hydrographic Department of the Royal Navy has for some years been assisting in the measurement of gravity at sea, mainly in providing ship facilities for scientists and their equipment. The extensive gravity surveys undertaken in the Indian Ocean by the Department of Geodesy and Geophysics, Cambridge University during the period 1961-63 were carried out from H.M.S. OWEN, one of the Department's Surveying Ships.

The first part of Cambridge University's extensive work in the Indian Ocean (H.M.S. OWEN 1961-62) has been published in Admiralty Marine Science, publications n°4 (parts I and II). The second cruise reprinted on the "Index sheet of open sea gravity measurements" was communicated by A.DAY (1966) ; the results will be published as n°9 in the same series.

A gravity survey of a large area in the Western Approaches to Gibraltar was completed in 1965. The survey was commenced in the area off N.W. Spain, on board DISCOVERY and continued in 1966.

In addition to these relatively large scale surveys, H.M.S. VIDAL and the Netherlands's Navy ship "Snellius" have been running E.W. lines across the North Atlantic Ocean at a 3 degree latitude spacing, in a project entitled "Operation NAVADO". The gravity lines (approximately 10° - 13° - 16° - 19°N) were run with the Cambridge gravity meter on board of a British Royal Navy ship.

Near to the coasts of Britain, the Department of Geology, University of Durham (Dr. M.H.P. BOTT) has been continuing a regional gravity survey of the north Irish Sea using an underwater gravity meter. During summers 1963 1964 and 1965 a total of 200 new gravity stations have been established and the broad features of the gravity field covering this region are now well known. These surveys have been connected, through harbour bases, to the Geological Survey base network.

The same gravity meter has been used by the Department of Geology, University of Glasgow (Dr. A.C. McLEAN) for sea measurements in the Fifth of Clyde to extend existing surveys round the coasts. The northern parts of the Firth were surveyed during a five-week season in 1964, and it is planned to complete the coverage of the whole Firth in a further eight-week survey in 1965.

(W. BULLERWELL, Nat. Rep. IGC. 1965)
(A. DAY, information, 10.1966)

In addition, the I.G.B. received complementary information on recent work from the following Services :

Hydrographic department of the Royal Navy

- 2 tracks E.W. between Norway and Greenland (about 65°N) and around Iceland,
- a crossing from Great Britain to the Antilles
- a crossing off the West Coast of South Africa

(G.E. MURT, 10.1966)

University of Birmingham

- tracks approximately from :
  . Gibraltar, via Falkland Islands to Antarctic,
  . Gibraltar, via Ascension Island to The Cape.

"Over these tracks gravity was recorded by the Geophysics Department of Birmingham University on H.M.S. Protector during 1965-66. Gravity data were recorded using a Graf-Askania sea gravimeter n°11, Borrowed from Cambridge University. All navigation was by astronomical, radar or visual fixing.

The data are in process of reduction and will be published in due course as a British Antarctic Survey Scientific Report.

We are hoping to work again in the region south of the Falkland Islands during 1967-68".

(F.J. DAVEY, 10.1966)

ITALIE

Les nombreuses croisières gravimétriques faites en Méditerranée par l'Observatoire géophysique de Trieste en collaboration avec le Conseil National de la Recherche et le Centre de Recherches Saclant ASW ont déjà été résumées dans le Bul. Inf. n°12, p.6.

JAPON

Two kinds of surface ship gravity meters both being the dynamic gravity meter type are now in practical use. One is Tokyo Surface Ship gravity meter developed by the University of Tokyo, and the other is the sea gravity meter developed by the Geographical Survey Institute.

Based on the Upper Mantle Project, sea gravity surveys have been made by using these instruments under the cooperation of the Hydrographic Office, the Maritime Safety Board. The first series was carried out over the northern part of Japan Trench in the Pacific Ocean in August, 1964, and in spite of unfavourable sea condition, fairly good results were obtained. The second series was made in Japan sea in April and May, 1965.

Tokyo Surface Ship gravity meter, TSSG-1, was used in the "International Indian Ocean Expedition, 1963-64", and the eastern part of the ocean was surveyed. The same instrument was used for gravity survey in Antarctic ocean from 150°E to 160°W in 1964-65.

According to Japan-U.S. scientific cooperation program, sea gravity survey was in operation in the western part of the Pacific Ocean using the GS1 sea gravity meter in 1965, to compare this result with that obtained by an Askania sea gravity meter of the American survey ship which cooperate with us.

(Nat. Rep. IGC. 1965)

PAYS-BAS

Cruise of NAVADO III through the Atlantic Ocean ; the crossing, made by H. Neth, M.S. Snellius during NAVADO III are indicated on the index sheet. Measurements were carried out with Askania sea gravimeter in 1965. The first crossing was made East-West at 22°N latitude. Line spacing was 3 degrees latitude to 55°N. Two crossings were made (35,000 nautical miles).

Continental shelf North of Surinam : gravity measurements were made in April 1966 by H. Neth, M.S. Snellius between 6°-8°N and 55°-57°W.G.

Publications of both surveys are under preparation at the Department of Geodesy of the Technicological University at Delft, which department also carried out the measurement.

(W. LANGERAAR, 10.1966)
(G.J. BRUINS, 11.1966)

U.R.S.S.

"In accordance with your intentions to prepare a summarising map of the gravimetrical coverage of the World Ocean, the Soviet Geophysical Committee should undertake in the nearest future the preparation of a map showing all the cruises with gravity measurements carried out by the institutions of the Academy of Sciences. A little later we shall be able to send you the Catalogue of these determinations as well".

(J. BOULANGER, 11.1966)

Le Bureau Gravimétrique International remercie les Services qui ont bien voulu lui indiquer les travaux effectués sur mer et souhaite que les résultats de ces campagnes puissent être publiés pour l'avancement des travaux scientifiques.

Le Bureau Gravimétrique International demande que toute omission ou erreur concernant la "chart of open seas gravity measurements" placée à la fin de ce Bulletin lui soit communiquée rapidement. Si nécessaire, une note complémentaire paraitra dans le Bulletin n°15 (février 1967).

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MESURES de la PESANTEUR en MER

(APPAREILS et RESULTATS)

A - APPAREILS

(Information complémentaire)

(54) BOULANGER Ju.D. - "Gravimètre en quartz pour la mer".
Acad. Sci. URSS. n°5, p.88-89. 1962. (texte russe)

Description et photo du gravimètre GAL - P.

Le système sensible est formé par 2 systèmes de quartz et basé sur l'utilisation des propriétés élastiques des fils. Les systèmes sont immergés dans un liquide silico-organique visqueux, ce qui permet la compensation thermique et le freinage nécessaire.

Le système sensible est enfermé dans un double thermostat électrique.

Les lectures sont automatiquement enregistrées sur une pellicule photographique. L'appareil est suspendu par une suspension légère à la cardan fixée sur le bord du navire. La suspension à la cardan pour amortir les oscillations propres du gravimètre est munie d'amortisseurs spéciaux.

"Comme nous l'a montré l'expérience, il est rationnel d'effectuer des déterminations gravimétriques en mer à l'aide d'un groupe de gravimètres composé de 3 ou 4 appareils. Ainsi, l'erreur accidentelle est de 1,5 mGal et l'erreur systématique ne dépasse pas 1 mGal, dans une zone de 2,5 à 3 mGal. Ces appareils sont déjà construits en petite série à l'Institut de Physique du Globe".

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*109- ČESNIKOVA T.S. & N.P. GRUŠINSKIJ. - "Mesures gravimétriques dans la mer du Groenland accomplies en 1956 sur le navire diesel-électrique OBI".
Astr. Inst. Geol. Fak. Mes. en mer, n°1 (1954-58), p.37-40. 1961

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* Suite des publications mentionnées dans les précédents Bulletins d'Information : Mai 1960 - Avril 1962, n°3 et Février 1965, n°8.

110 - CHOJNICKI T. - "An experimental method of measurement with the gravimeter Askania Gs-11 on a frozen sea".
Proc. Inst. Geod. & Cart. T.XIII, Z.1 (28), p.127-149. Warszawa. 1966.

When in the winter of 1962-63 the Baltic sea was frozen on a comparatively large area, in the Institute of Geodesy and Cartography was conceived an interesting idea of making gravimetric measurements on the sea ice surface with a normal terrestial apparatus.

An experimental method of measurement under these conditions with the Askania Gs-11 Gravimeter was worked out. It is described here.

While considering the choice of measurement methods and instruments, the fact should be taken into account, that the ice on the sea surface is not absolutely firm, but makes some movements, which are caused by the movements of the water and therefore the measurement conditions will be quite different from those on the mainland. Accordingly it was resolved to use in this case the Gravimeter Gs-11, because its fundamental measuring system is in principle indentic with the system of Sea-Gravimeter Gss-2 and by suitable proceeding the Gravimeter Gs-11 could be used on a wavying surface, applying the analogies and experiences acquired during the work with the Gravimeter Gss-2. The analogies consisted in the fact, that the role of the mechanical damping device in the Gss-2, in the work with Gravimeter Gs-11 is performed by the frozen sea surface ; to an electric damping circuit in the Gss-2 corresponded the low sensibility range of the galvanometer in the Gravimeter Gs-11.

The theoretical considerations referred to in this paper were completed by the experimental measurements performed in some points on the sea ice surface, distant several kilometers from the shore line. These experiments have confirmed the reality of the measurements of this kind and the possibility of obtaining a precision of 1 - 2 mGal, the position error not included.

111 - COMOLET-TIRMAN.A. - "Quelques résultats sommaires d'études effectuées sur le gravimètre marin ASKANIA Gss-2 N°15".
Texte ronéotypé. 4 p. C.G.I.Paris, Sept. 1965.

Cette note du Service Hydrographique de la Marine Française mentionne l'utilisation satisfaisante du gravimètre Askania Gss-2 n°15, muni du dispositif de poursuite automatique et indique plusieurs causes d'erreur qui ont dû être précisées :

- Influence du champ magnétique (champ vertical : 1,35 mGal pour 0,1 Oerstedt - champ horizontal longitudinal : 1,8 mGal pour o,1 Oerstedt).
- Influence des vibrations (quatre principales fréquences critiques 13,9 Hz - 52,7 Hz - 94,0 Hz - 148,4 Hz, pouvant entraîner des erreurs de plusieurs milligals pour des niveaux d'accélérations de l'ordre de 70 décibels, niveaux définis par 20 $\log \frac{\gamma}{\gamma_0}$ avec $\gamma_0 = 10^{-3}$ cm/s^2 ; le plus souvent, il y a diminution apparente des mesures).

- Erreurs cycliques dans les lectures des axes de mesure.
Les études en laboratoire ont montré que le dépouillement pouvait s'effectuer uniquement sur l'enregistrement du "Minicomp" sans modification des amplitudes avec un retard constant.

112 - DEHLINGER P. - "Reliability at sea of gimbal-suspended gravity meters with 0,7 critically damped accelerometers".
J. Geophys. Res. v.69, n°24, p.5383-5394. 1964.

Since the spring of 1962, various reliability determinations have been made at sea with gimbal-suspended LaCoste and Romberg gravity meter S-9 with its accelerometers approximately 0,7 critically damped. Measurements used for determining the meter reliability were obtained in special tests past an offshore platform where gravity was known over a gravity range, from comparisons with previous pendulum measurements obtained in a submarine, and from intersections of gravity lines obtained on different surveys. The measurements were made in the Gulf of Mexico and in the Pacific Ocean on four different ships, ranging in size from 150 to 3000 tons. Measurements were found to be reliable when the meter beam recordings were straight and continuous, and unreliable when the beam recordings were nonlinear and oscillatory. When both horizontal and vertical accelerations are fairly uniform or nearly sinusoidal, beam recordings are linear and the measurements are reliable. When either the horizontal or vertical accelerations are impulsive or nonsinusoidal, beams recordings are oscillatory and measurements are in error, usually by + 15 or more milligals. The controlling factor in reliability of measurements is magnitude and uniformity of the accelerations, not ship size (with broad limits) or straightness of steering. Exclusive of navigation errors, measurements can be accurate to with 3 mGal at Browne corrections up to 300 mGal, within 5 mGal at corrections of 300 to 400 mGal, and within 8 mGal at corrections of 400 to 500 mGal. As Browne corrections increase, the errors in meter S-9 become systematically more positive.

113 - GAJNANOV A.G. - "Mesures gravimétriques en Antarctique, dans l'Atlantique et la Méditerranée au cours de la 9ème croisière de la flotille baleinière "SLAVA".
Astr. Inst. Geol. Fak. Mes. en mer, n°1,(1954-58) p.8-22. 1961.

On a effectué des mesures du champ de pesanteur dans le secteur Atlantique de l'Antarctique, les parties centrales de l'Atlantique et de la Méditerranée.

On a vérifié les possibilités de mesures pendulaires sur pétrolier et baleinier. On a éprouvé un appareillage au cours d'une croisière prolongée et dans des conditions difficiles. On peut en tirer les conclusions suivantes :

Sur le baleinier "SLAVA" d'un déplacement de 27.000 tonneaux et sur le pétrolier "APCHERON" de 13.000 tonneaux on peut effectuer des mesures pendulaires satisfaisantes avec une force de la mer de 3 à 4, en cours de navigation.

Pour tenir compte des corrections du 2ème ordre provenant de l'influence résiduelle des accélérations perturbatrices de tangage du navire sur la période des pendules fictifs, il faut disposer d'enregistrements de pendules à longue période (lents) et à courte période.

114 - GAJNANOV A.G. - "Mesures gravimétriques sur le navire diesel-électrique "OBI" au cours de sa première croisière Antarctique".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.23-36. 1961.

Ces travaux ont fourni pour la première fois des données sur le champ de pesanteur de la zone côtière du secteur indien de l'Antarctique. C'est la première fois que l'on a éprouvé et employé avec succès, pour des mesures pendulaires de la pesanteur, sur navires, des blocs pour enregistrements des accélérations et des générateurs à quartz comme étalons de temps. Cela a permis d'avoir des anomalies de Bouguer avec une erreur quadratique moyenne de $\pm$ 8 à 9 mGal.

Les épreuves de l'appareillage ont permis les conclusions suivantes :

1) On ne peut accomplir qu'à l'arrêt des observations pendulaires satisfaisantes sur le navire diesel-électrique "OBI" à cause de la forte vibration des machines.

2) Par suite du fort tangage de ce navire, on ne peut réaliser d'observations satisfaisantes que par temps calme ou une mer de force 1 à 2, ainsi que dans les glaces. Si la houle est supérieure, l'influence perturbatrice des accélérations provenant du tangage du navire augmente et sa prise en considération devient impossible sur le photo-enregistrement du bloc "RNVU". En cas de tangage intense, les pendules de longue période du bloc oscillent à des amplitudes supérieures et heurtent souvent les butées et le photo-enregistrement des pendules différentiels est affecté de fortes fluctuations des repères de temps.

115 - GAJNANOV A.G. & L.P. SMIRNOV. - "Etudes gravimétriques sur le navire d'expédition "VITJAZ" dans le Pacifique en 1957-58".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.77-99. 1961.

Description et méthode des mesures en mer.
Dépouillement des résultats : avec appareil pendulaire
avec gravimètre.
Stations de bases à Moscou et Vladivostok.

116 - GRUSNINSKIJ N.P. - "Mesures en mer de la pesanteur en Antarctique en 1956-57".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.41-62. 1961.

Bilan de l'expédition :

1) Mesure de la pesanteur en des points gravimétriques marins des eaux antarctiques et de l'Océan Indien, dans des zones non encore étudiées.

2) Usage réussi d'un gravimètre amorti sur navire à l'air libre et détermination de la pesanteur en mer.

3) Introduction de perfectionnements sur l'appareillage et la méthode de travail : avant tout emploi satisfaisant d'horloges à quartz élaborées à notre Laboratoire de Gravimétrie.

117 - GRUSNINSKIJ N.P. - "Bilan de l'emploi d'un gravimètre sur navire à l'air libre".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.69-76. 1961.

Les observations avec un prototype de gravimètre amorti sur le navire diesel-électrique "OBI" ont permis les conclusions suivantes:

1) Le gravimètre ainsi conçu est valable pour la mesure de la pesanteur sur des navires de surface. Sans perfectionnements notables, il est aisé d'atteindre une précision de $\pm$ 10 mGal en l'utilisant comme appareil d'interpolation en association avec des pendules.

2) Avec un enregistrement photo-électrique, un stabilisateur hygroscopique et un accélérographe, on améliorera notablement la précision.

3) L'emploi de gravimètres associés avec des pendules permettra d'améliorer substantiellement le rendement du travail.

4) L'observation du gravimètre, au contraire des pendules, est possible par fort tangage et avec une marche ralentie du navire. En ce qui concerne les observations possibles à pleine marche avec des vibrations importantes, des expériences ultérieures sont nécessaires en vue de conclusion définitive. On peut toutefois escompter une solution positive.

5) La précision des mesures en 62 points gravimétriques se caractérise par une erreur quadratique moyenne de $\pm$ 10 mGal.

118 - HAYGES D.E. - J.L. WORZEL. & H. KARNICK. - "Tests on the 1962 model of the Anschütz Gyrotable".
J. Geophys. Res. v.69, n°4, p.749-757. 1964.

The Anschütz Gyrotable which was built especially for stabilization of a sea gravimeter was tested in the laboratory for a variety of simulated sea conditions. It was found that the error

signal incorporated in the electronics of the Anschütz system adequately measured the deviation of the stable platform from true horizontal. The peak-to-peak amplitude of the table was found to be a function of the amplitude and period of the simulated ship motions and ranged between 1 and 4 minutes of are. It was also found that the phase lag of the table motion with the "ship" motion was not constant but ranged between 180° and 270°, depending on the period and amplitude of the motion. The platform deviation is briefly analyzed in relation to the simulated ship motions. It is estimated that, on R.V. Vema, an off-leveling error of the order of 3 mGal might result from residual table motions under typical sea conditions. Data for correction of the off-leveling error can be processed from suitably recorded parameters.

119 - HEJFEC M.E. - "Appareillage CNIIGAIK pour mesurer les déviations et accélérations des appareils pendulaires dans les déterminations gravimétriques en mer".
Trudy Cniigaik, n°139, p.103-120. Moscou. 1960.

120 - HEJFEC M.E. - "Quelques problèmes de la théorie d'oscillation des pendules sur une plateforme horizontale mobile".
Trudy Cniigaik, n°159, p.5-28. Moscou. 1964.

121 - KUZIVANOV V.A. & E.I. POPOV. - "Dépouillement des observations marines avec gravimètres superamortis".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.100-108. 1961.

On utilise de plus en plus les gravimètres superamortis. Ces appareils ont été ainsi nommés parce que l'amortissement de leurs systèmes élastiques dépasse beaucoup l'amortissement critique, grâce à quoi l'action des accélérations verticales à courte période diminue, car le mouvement du pendule devient apériodique.

122 - KUZIVANOV V.A. & A.G. GAJNANOV. - "Sur la mesure du champ magnétique lors des observations pendulaires en mer".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.109-111. 1961.

Dans les mesures relatives de la pesanteur effectuées avec des pendules en invar, les variations du champ magnétique du Globe peuvent provoquer des erreurs systématiques de plusieurs dizaines de milligals ; c'est pourquoi il est nécessaire, soit d'introduire les corrections voulues, soit de protéger l'appareil de l'effet des champs magnétiques.

123 - MALAHOV B.M. - "Travaux expérimentaux avec un appareil pendulaire sur un navire de surface".
Trudy Cniigaik, n°159, p.29-60. Moscou. 1964.

Schéma de l'appareil NMP. - Résultats des études. - Tableau de comparaison de résultats en surface et sous l'eau.

L'appareil est de petites dimensions, présente une faible distance entre le centre de gravité et l'axe d'oscillations et la masse pendulaire est constituée par un alliage de tungstène, de nickel et de cuivre.

A la suite d'essais faits sur la maquette de cet appareil, l'auteur conclut : - Que la précision des mesures est satisfaisante dans le cas d'une mer de force 5, sur un navire tirant 6.000 tonnes.
- Que l'utilisation d'une plateforme stabilisée permet une précision de l'ordre de 10 mGal.

De plus, on a mis au point, une méthode permettant de contrôler les mesures de la période pour un pendule au rayon de courbure variable. Les expériences ont montré que la forme du tranchant du couteau que le pendule acquiert avec le temps, peut-être exprimée d'après une loi déterminée et que le terme de BROWNE pour les accélérations horizontales peut-être compensé partiellement ou entièrement...

124 - MARCUK G.D. - "Détermination des caractéristiques d'amortissement des gravimètres marins".
Soob. Gais. n°135, p.30-42. 1964.

125 - MORELLI C. - "Gravity measurements on surface-ships".
Le pétrole et la mer. Section I, n°107, p.1-10. 1965.

The error causes on surface ship gravity measurements are briefly outlined. The present state of the art is analized with special reference to the LaCoste and Romberg and the Graf-Askania gravity meters. For them, the latest improvements are described and the actual possibilities discussed, also on the basis of the great number of experimental results. The present stage of accuracy, with good navigation aids, can be considered of the order of 2-3 mGal, but better accuracies are possible.

126 - ORLIN H. - "Marine gravity surveying instruments and practice".
U.S.C&GS. Ohio State Univ. Typewritten text, 12 p. 1966.

Although modern marine gravity meters are capable of accuracies of better than $\pm$ 3 mGal under normal operating conditions, it is difficult to differentiate between various sets of data. Therefore $\pm$ 3 mGal must be the minimum standard deviation to be expected.

127 - PANTELEEV V.L. & P.A. STROEV. - "Enregistrement des accélérations verticales au moyen d'un gravimètre à corde".
Astr. Inst. Geol. Fak. Mes. en mer, n°2, (1958-60) p.86-92. 1963.

128 - PANTELEEV V.L. - "Influence de l'irrégularité de tangage du navire sur la précision de l'enregistrement des accélérations lors des mesures gravimétriques".
Soob. Gais. n°135, p.19-29. 1964.

Les dispositifs accélérométriques pour l'enregistrement des accélérations perturbatrices lors de la détermination de la pesanteur en mer sont des systèmes sélectifs en fréquence. Pour une détermination exacte des correctifs d'accélération, il faut tenir compte de la composition spectrale, car on pourrait avoir faute de cela des erreurs importantes sur le coefficient d'échelle de l'accéléromètre.

Si l'un des éléments du bloc accélérométrique est un pendule lent posé sur couteau, sa qualité est dans une grande mesure définie par le profil dudit couteau. Un pendule à couteau asymétrique présente sous accélérations aléatoires des perturbations à résonance, ce qui le rend inutilisable en pratique pour l'enregistrement des accélérations. Mais même un pendule à couteau asymétrique sera affecté de perturbations de résonance si le spectre des accélérations perturbatrices est suffisamment large.

129 - POPOV E.I. & V.V. SUKHODOL'SKII. - "Test-stand studies of marine gravimetric apparatus".
Izvest. Geophysics series. 1964.
C.R. : Geophysics. v.XXX, n°1, p.169. 1965.

A brief description of the IS-M test stand is given, and the results of the first studies under conditions of sign-changing linear accelerations and inclination of marine gravimetric apparatus are described. This encompasses horizontal and vertical accelerometers, long-period pendulums, an experimental model of an above-water pendulum instrument, and heavily damped gravimeters. It is shown that, with the limits of reading accuracy with perturbing accelerations of up to 50 gal, the results of observations with heavily damped gravimeters correspond to the calculated values of the variations in their readings. The effect of compensation of the residual effects of horizontal accelerations on the pendulum instrument is confirmed. The accuracy of the horizontal and vertical accelerometers and long-period pendulums of RNU and RUG instruments is evaluated under conditions of sign-changing perturbing accelerations.

130 - STROEV P.A. - "Essais d'un prototype de gravimètre à cordes".
Astr. Inst. Geol. Fak. Mes. en mer, n°2, (1958-60) p.93-104. 1963.

Le gravimètre à cordes a été essayé pour la première fois dans les conditions de travail en mer. Au cours de ces essais, on a soumis l'appareil à diverses vérifications et on a déterminé 30 points gravimétriques au cours de la deuxième expédition, sur lesquels 28 ont été simultanément déterminés avec un appareil pendulaire. En définitive, on peut faire les conclusions suivantes :

1) La précision de la détermination de la force de pesanteur à l'aide du prototype de gravimètre à cordes s'est révélée insuffisante, de l'ordre de $\pm$ 18 mGal, probablement par suite de l'échantéité imparfaite de l'appareil et par suite de l'instabilité du système employé. Cependant, les essais ont confirmé qu'il serait possible d'utiliser le gravimètre à cordes pour les travaux gravimétriques en mer, à condition d'apporter des améliorations notables à sa construction.

2) Au cours des essais du gravimètre à cordes, on n'a pas observé de variation du zéro. Du fait de l'inexistence ou de l'imperceptibilité de cette variation, il est permis de bien augurer de l'avenir du gravimètre à cordes pour des croisières prolongées en mer.

3) Le remplacement des tubes des générateurs à cordes et à quartz par des semi-conducteurs s'est révélé parfaitement rationnel et a permis de réduire le poids et l'encombrement de l'appareil, ainsi que de simplifier et de stabiliser l'alimentation de ses générateurs. La fréquence du générateur à quartz s'est révélée à ce point constante, que les erreurs dans la détermination de la force de pesanteur par rapport à la fréquence étalon SGP-2 sont de loin inférieures à celles des mesures elles-mêmes.

131 - ZOMMER I.E. & A.G. GAJNANOV. - "Méthode et résultats de mesures de la pesanteur en Antarctique".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.63-68. 1961.

Les observations gravimétriques accomplies en 1956-57 ont permis de préciser les modalités d'emploi de différents genres d'observations en Antarctique. Le caractère mis en évidence de l'anomalie du champ de pesanteur indique que l'influence de l'écart du fil à plomb peut-être notable lors des mesures astronomiques en Antarctique. Un petit relevé avec gravimètre accompli sur un glacier à l'intérieur du continent indique la possibilité et l'avantage de la méthode gravimétrique pour l'étude du relief rocheux enseveli sous les glaces.

Voir aussi n°135 - 147 - 186.

B - GENERALITES et RESULTATS *

132 - ALLAN T.D. - H. CHARNOCK. & C. MORELLI. - "Magnetic, gravity and depth surveys in the Mediterranean and Red Sea".
Nature, v.204, n°4965, p.1245-48. 1964.

133 - ALLAN T.D. & C. MORELLI. - "Geophysical surveys in the Mediterranean and Red Sea during the period 1961-64".
Oss. Geof. Sper. n°158bis. Trieste. 1965.
from : Rap. & Procès verbaux des réunions de la CIESMM, v.XVIII, n°3, p.911-916.

In the two articles above mentioned a summary of the geophysical work is given : joint programme of gravity, magnetic and bathymetric survey work. Particularly, it is shown two typical profiles, one across the central rift of the Red Sea and the other through Crete from the African coast to the Centre of the Aegean Sea.

Note. A complementary study is to be remarked :
ALLAN T.D. - "A preliminary magnetic survey in the Red Sea and Gulf of Aden". Bol. Geof. tero. appl. v.VI, n°23, p.199-225. Trieste.1964.

"... It was found that the southern half of the Red Sea is characterised by an axial trough which has an associated magnetic anomaly. In the North, where the trough is poorly developed, the anomaly is absent. The trough and magnetic anomaly are considered to have been caused by a tensional rift through which bacis rock has been intruded"...

134 - ALLAN T.D. & M. PISANI. - "Gravity, magnetic and depth measurements in the Ligurian Sea".
Oss. Geof. Sper. n°159bis. Trieste. 1965.
from : Rap. & Procès verbaux des réunions de la CIESMM, v.XVIII, n°3, p.907-909.

Track chart of R/V "Aragonèse" in the Ligurian Sea.
Bathymetric chart and chart of the Bouguer anomaly in the gravity field. Profile showing bathymetry, gravity Bouguer and free-air anomaly and total magnetic field.

* Les résultats gravimétriques de quelques iles situées au milieu des océans ont été indiqués dans cette rubrique.

135 - ANDERSEN Ole B. - "Preliminary Danish activity in the field of gravity measurements at sea".
Typewritten text, 5 p. + map presented at the I.G.C. Paris, Sept.1965.

"A brief provisional report of the danish activity in the field of gravity measurements is given. Gravity measurements were carried out with the sea gravimeter Graf-Askania, mounted on a gyrostabilized platform.

Some provisional results and considerations are given, particularly on the accuracy of measurements. Three main sources of errors are mentioned :

- The automatic resetting attachment
- The gyrostabilized platform
- The determination of position, course and speed.

The final accuracy of the determined anomaly values thus, is estimated to be $\pm$ 2 mGal".

It is to be noticed that the attached map (anomalies in the Skagerrak) is a map with free-air anomalies not Bouguer anomalies as it is written.

136 - ANDERSEN E. - "Gravity anomalies in the Skagerrak".
Geod. Inst. Typewritten text, 5 p. Copenhagen. 1966.

List of gravity stations (coordo., depth, free-air and Bouguer anomalies) relative to the map mentioned above.

137 - ANDERSEN E. - "Data from the North Atlantic profile".
Geod. Inst. Typewritten text, 8 p. Copenhagen. 1966.

138 - BOTT M.H.P. & P. SCOTT. - "Gravity measurements from H.M.S. SHACKLETON, August 1961".
Dept. Geol. Typewritten text, 3 p. + stations list. Durham. 1962.

"The appended gravity observations were made from H.M.S. SKACKLETON during the period 21st to 29th August 1961, using an underwater gravity meter kindly loaned to us by the Shell Oil Company, Ltd. Observations were made in the Irish Sea, the Bristol Channel and off the Cornish Coast. A total of 29 new gravity stations were occupied".

139 - BOTT M.H.P. - "Gravity measurements in the North-Estern part of the Irish Sea".
Quart. J. Geol. Soc. v.120, p.369-396 + Bouguer anomalies map. 1964.

"During the summer of 1961 124 new gravity measurements were made in the north (mainly north-east) Irish Sea with an underwater gravity meter.

In north-west England, south-west Scotland, and Northern Ireland a regional rise in the Bouguer anomaly is observed on approaching the north Irish Sea ; a high regional Bouguer anomaly of more than 40 mGal is also characteristic of the Isle of Man. The author considers that this reflects either a crustal thinning of about 3 km or a denser crust (by about 0.03 g/cm^3) beneath the Irish Sea, denser basement rocks may in part be responsible. Over most of the sea area surveyed negative gravity anomalies of 20 mGal to 40 mGal amplitude are superimposed on the high regional Bouguer anomaly. Both the shape of the anomalies and their correlation with the surrounding coastal geology suggest that they are essentially caused by large sedimentary basins. Coastal geology suggests that Carboniferous and New Red Sandstone rocks form the major "fill", although sediments of Old Red Sandstone or post-Triassic age cannot be ruled out.

A negative anomaly of nearly 20 mGal amplitude forms the south-eastern continuation into Luce Bay of the negative anomaly over the Stranraer New Red Sandstone basin. It closes to the south-east near the mouth of Luce Bay. As on land, it is interpreted as an asymmetrical basin of New Red Sandstone and earlier sedimentary infill with a steep north-eastern margin, reaching a maximum depth of at least 1340 m. (4400 ft).

A single gravity traverse westwards from Peel reveals a sharp gravity drop of about 15 mGal immediately off shore ; this is interpreted as a sedimentary basin lying off the west coast of the Isle of Man. The Isle of Man thus appears to be an uplifted horst-like region of Lower Palaeozoic rocks with the north-western and south-eastern coastlines controlled by the margins of steep-sided sedimentary basins of post-Lower Palaeozoic age".

140 - BUREAU OF MINERAL RESOURCES, Australia.
- Records 1959/69, 1959/70, 1959/156, 1958/102, 1958/103, 1959/604, 1959/71.
- Report n°73.

Results of underwater gravity work in Northern Australian Waters on the M/V "KANO", in 1958.

141 - BUREAU OF MINERAL RESOURCES, Australia.
- Recored 1963/42, 1963/43.

Pendulum observations in submarine H.M.S. Telemachus in south-west Pacific in collaboration with Columbia University. (1956).

142 - COLLETTE B.J. - R.A. LAGAAY. & A.R. RITSEMA. - "Depth of the Mohorovicic discontinuity under the North Sea Basin".
Nature, v.205, n°4972, p.688-689. 1965.

"During this summer and autumn, refraction seismic experiments were carried out on the North Sea on a line with azimuth 150° starting from a position 54°40'N and 3°20'E.G..

The first result seems to confirm the conclusion drawn from gravity data that in general the mass deficiency of the North Sea Basin sediments is compensated isostatically".

143 - COMMISSIONE GEODETICA ITALIANA. - "Relazione sulla campagna gravimetrica dell'Arcipelago Toscano, 10-28 Sept. 1959".
Verbali della 56a 57a 58a sessione plenaria Com. Geod. Ital. p.216-222. Bologna. 1963.

Mesures effectuées dans les iles de l'Archipel Toscan avec deux gravimètres Worden.

Liste des 59 observations et carte d'anomalies de Bouguer.

144 - COOK E. - "Geophysical operations in the North Sea".
Geophysics. v.XXX, n°4, p.495-510. 1965.

"During the last three years the discovery of the world's second largest natural gas field at Groningen in the Netherlands has touched off in the North Sea one of the greatest competitive offshore geophysical operation in history. Before 1962, only minor amounts of geophysical work had been done there.

As a preliminary, the geophysics of the Groningen area are discussed. A gravity compilation of the North Sea shows that there are three major basins - the Northwest German Zechstein Basin, the British North Sea Basin, and the Norwegian North Sea Basin. The British Basin which contains Tertiary, Cretaceous, Jurassic, Triassic, Permian, Carboniferous, and older sediments shows considerable salt movement with salt domes, walls, and pillows being in evidence to within 30 miles of the eastern coast of England.

Refraction studies indicate that two main refractors, the Upper Cretaceous Chalk and the Upper Magnesian Limestone of the Permian, are present over most of the British Basin.

Mapping the key basal Permian reflector is made difficult by deterioration of the reflection under areas of salt growth. Stacking sometimes enhances this reflection. Also intrusions of Permian salt into the Mesozoic beds give rise to large and rapid changes in thickness of the overlying low-velocity Cretaceous chalk sections. A correction system for these large lateral velocity changes is described".

145 - DEHLINGER P. & B.R. JONES. - "Free-air gravity anomaly map of the Gulf of Mexico and its tectonic implications, 1963 edition".
Geophysics. v.XXX, n°1, p.102-110. 1965.

"As part of a continuing program, Texas A. and M. University has been making a surface ship gravity survey of the Gulf of Mexico. The 1963 free-air anomaly map of the Gulf is the second in a series of maps resulting from these investigations ; it includes not only a larger area than the first map, but also measurements having considerably higher accuracies. The present map indicates, as the first one suggested, that the Gulf of Mexico is essentially in isostatic equilibrium but contains local mass anomalies. Two cross sections of crustal layers were constructed which are consistent with the gravity observations and published seismic-refraction results. One section extends from Galveston, Texas, to the Yucatan Peninsula, and the other from the Sigsbee Deep to Florida. Both sections consist of four to six layers, in which layer densities were assumed to be uniform laterally and the density below the Mohorovicic discontinuity constant. Densities of the layers were converted from seismic velocities using the Drake and Nafe curves. A free-air anomaly profile across the Cayman Trench is included".

146 - FEDYNSKIJ V.V. - "Problèmes des expéditions gravimétriques marines de l'Université d'Etat de Moscou. (1954-58)".
Astr. Inst. Geol. Fak. Mes. en mer, n°1, (1954-58) p.3-7. 1961.

147 - FLEISCHER Von U. - "Schwerestörungen im östlichen Mittelmeer nach Messungen mit einem Askania-Seegravimeter".
Dtsch. Hydrogr. Band 17, H.4, S.154-164. 1964.

"Gravity anomalies in the Eastern Mediterranean as measured with the Graf-Askania sea gravimeter.

At the end of 1961, the area round the isle of Crete distinguished by large gravity anomalies was subject to thorough investigations and for this purpose continous gravity profiles were run. The material of the above research and the results of former submarine pendulum measurements were included in a detailed isogram map of free-air anomalies of the whole Eastern Mediterranean. From this map the Bouguer anomalies and the isostatic anomalies were derived and represented on coloured maps.

A comparison of two Askania sea gravimeters operated simultaneously, demonstrates an instrumental accuracy of about 2 mGal for the gravity values measured from the ship underway. In addition there resulted mean errors of about 5-6 mGal from uncertainties in the determination of the position (Eötvös effect), in the terrain correction, and in the isostatic compensation. The free-air anomalies

are thus to be stated with an accuracy of about ± 6 mGal, the Bouguer anomalies with an accuracy of about ± 8 mGal and the isostatic anomalies with about ± 10 mGal. Considering the fact, that the anomalies can assume positive and negative values of up to 200 mGal, this accuracy is completely sufficient.

The measurement of gravity shows that the Eastern Mediterranean has, to a great extent, not yet reached the state of equilibrium. The movements of compensation have developed differently in the individual parts of the area ; the least advance is found in the area of the isle of Crete.

The present morphology of this area has probably developed from an uplifting of the sea bottom of the Aegean Sea and a depression outside the island are Kithira - Crete - Rhodes. Taking into account that before the beginning of this movement isostasy prevalied, the medium depth of the water must have been about 1500 m.

The combination of gravity anomalies with the present morphology of the ring zone extending in front of the three islands of Kithira, Crete and Rhodes results in a mean density of the substratum of about 3,0 g/cm^3. The extreme south-east of the Mediterranen, however, is in almost complete equilibrium. Between these two zones lies a transition zone showing - like the Aegean Sea - an unbalanced density contrast of about 2,1 g/cm^3".

148 - FROLOV A.I. - "Travaux gravimétriques de l'Institut Astronomique d'Etat "Sternberg" réalisés au cours de la troisième expédition soviétique dans l'Antarctique en 1957-58".
Astr. Inst. Geol. Fak. Mes. en mer, n°2 (1958-60) p.3-18. 1963.

"Durant la 3ème croisière du navire à moteur électrique et diesel l'OBI, le groupe gravimétrique a déterminé 192 points sur le continent, les glaces de barrière et en mer.

L'erreur moyenne **relative** à la mesure des anomalies de pesanteur sur le continent et sur les glaces varie entre ± 1,7 et ± 3,7 mGal.

L'erreur moyenne quadratique, en ce qui concerne les mesures effectuées dans les ports et sur les glaces de l'Antarctique a été de ± 3 mGal. La précision des mesures effectuées en pleine mer a été de l'ordre de ± 10 et ± 11 mGal par suite des accélérations perturbatrices et surtout du fait de la précision insuffisante des corrections relatives aux accélérations horizontales.

Les erreurs moyennes obtenues, aussi bien en ce qui concerne la concordance interne des résultats que pour ce qui est des erreurs dans les corrections des accélérations perturbatrices, à l'aide d'une formule empirique, reflètent probablement avec fidélité la précision réelle des mesures effectuées en mer".

Carte des emplacements des stations gravimétriques.

149 - FROLOV A.I. - "Travaux gravimétriques de l'Institut Astronomique d'Etat "Sternberg" réalisés au cours de la cinquième expédition soviétique dans l'Antarctique en 1959-60".
Astr. Inst. Geol. Fak. Mes. en mer, n°2, (1958-60) p.19-34. 1963.

150 - GAJNANOV A.G. - "Sur quelques résultats des études gravimétriques dans la mer d'Okhotsk, la fosse Kouriles-Kamtchatka et les parties voisines du Pacifique".
Astr. Inst. Geol. Fak. Mes. en mer, n°2 (1958-60) p.66-76. 1963.

151 - GLADYN V.A. - G.D. MARCUK. - V.L. PANTELEEV. & P.A. STROEV. - "Etudes gravimétriques dans la région de la fosse Kouriles-Kamtchatka et le nord-ouest du Pacifique en 1958".
Astr. Inst. Geol. Fak. Mes. en mer, n°2 (1958-60) p.77-84. 1963.

Etude de la précision des mesures.

152 - GOODACRE A.K. - "A shipborne gravimeter testing range near Halifax, Nova Scotia".
J. Geophys. Res. v.69, n°24, p.5373-5381. 1964.

"The Dominion Observatory has established a shipborne gravimeter testing range near Halifax, Nova Scota, in an area where a variety of ocean conditions exists. About 200 stations were occupied with a LaCoste and Romberg underwater gravity meter at depths up to 135 fathoms over a square area, 30 nautical miles to a side which is covered by a precise navigational facility. The underwater gravity measurements have been reduced to an arbitrary datum near sea level. Random errors in the reduced gravity values are estimated to be of the order of 1 mGal, and it is concluded that the range is satisfactory for checking the performance of shipborne gravity meters".

153 - GRAHAM K.W.T. & A.L. HALES. - "Surfaceship gravity measurements in the Agulhas Bank area, South of South-Africa".
J. Geophys. Res. v.70, n°16, p.4005-4011. 1965.

"In 1962 reconnaissance gravity measurements were made in the South Indian Ocean immediately south of South Africa with a Graf-Askania surface ship gravimeter with automatic beam control. A free-air anomaly chart with an average standard deviation of about 7 mGal is presented. Errors due to the response of the meter, instrumental drift, imperfect navigation, platform deviation, the Harrison effect

and cross-coupling are discussed. It is concluded that the Harrison, cross-coupling, and navigational errors should generally be less than 6 mGal each but may occasionally be much larger. Other errors are insignificant by comparison. A crustal profile, calculated by the technique of Talwani and others (1959) suggests that the structure of the Agulhas Bank is not markedly dissimilar from other published continental shelf-slope profiles but the Agulhas Plateau may not be typically oceanic".

154 - GRUSINSKIJ N.P. & M.U. SAGITOV. - "Rôle des courants marins dans l'étude du champ gravitationnel extérieur du Globe".
Astr. Inst. Geol. Fak. Mes. en mer, n°2, (1958-60) p.105-114. 1963.

155 - HAWKINS L.V. - J.F. HENNION. - J.E. NAFE & R.F. THYER. - "Geophysical investigation in the area of the Perth Basin, Western Australia".
Geophysics. v.XXX, n°6, p.1026-1052 (with Bouguer anomalies maps) 1965.

"Marine geophysical investigations in the area of the Perth Basin lead to proposed cha ges in the structural control of the basin and of the structure within the basin. The main north-south graben structure appears to be crossed by a series of major faults which trend roughly north-northwest. A broadening of the basin to a width of just over 100 km (65 miles) to the west in the area between Perth and Harvey, which was earlier indicated by aeromagnetic results, appears to be produced by two such faults : The southern fault does not cross the graben but merges with it in the form of the Dunsborough Fault ; the proposed northern fault crosses the graben to produce a break in continuity of the Darling Fault which marks the eastern margin of the basin. The western margin of the basin appears to be formed by an eastward-tilted basement with associated faulting which, in places, assumes major proportions. A tentative estimate of sediment thickness of about 5.7 km (18,600 ft) is obtained from a seismic profile near the axis of sedimentation on the extension of the Bunbury Trough. This figure is our preferred interpretation, but it would have to be reduced to about 3.5 km should a 5-km/sec layer turn out to be basement. The southward extension of the Darling Fault onto the narrow continental shelf appears to be observed with a throw of two km to the south of Pt d'Entrecasteau".

156 - KEEN C. & B.D. LONCAREVIC. - "Crustal structure on the eastern seaboard of Canada : studies on the continental margin".
Can. J. Earth Sci. v.3, p.65-76. 1966.

"The results of several seismic refraction profiles on the continental shelf and slope of the eastern seaboard of Canada are now available. Gravity measurements which begin near the coast of Nova Scotia and end over the abyssal plain have also been made along two tracks perpendicular to the shelf edge. Various models for the crustal and upper mantle structure are presented. A density distribution assumed for each model resulted in a computed gravity field satisfying the observed gravity measurements. The models in agreement with all seismic data suggest that horizontal and vertical density variations occur in the upper mantle down to 100 km. The results indicate a mantle density of 3,42g/cm^3 under the continental shelf and 3,32g/cm^3 under the ocean basin".

157 - KORJAKIN E.D. - "Champ gravitationnel de l'Atlantique et relation avec la structure profonde de l'écorce terrestre".
Astr. Inst. Geol. Fak. Mes. en mer, n°2, (1958-60) p.35-50. 1963.
Plusieurs profils à travers l'Atlantique avec les anomalies et la surface de Mohorovitch.

158 - KORJAKIN E.D. - "Quelques particularités structurales de l'écorce terrestre dans la zone de transition entre Atlantique et Continents américain et antarctique".
Astr. Inst. Geol. Fak. Mes. en mer, n°2 (1958-60) p.51-65. 1963
Différents profils avec anomalies et structure de l'écorce terrestre.

159 - KUTSCHALE H. - "Arctic ocean geophysical studies : The southern half of the Siberia Basin".
Geophysics. v.XXXI, n°4, p.683-710 (with map of free-air anomalies).1966.

"In 1962, ice island Arlis II drifted over a portion of the southern half of the Siberia Basin. Depth recordings made between 81°N, 17°E and 82°30'N, 160°E show that the ocean floor in this area is an abyssal plain at about 2,85 m. depth dissected by several interplain channels. This abyssal plain, here called the Wrangel Abyssal Plain, is bounded on the north by Arlis Gap, which joins it with the Siberia Abyssal Plain at about 3,946 m. depth. The Siberia Abyssal Plain occupies the northern half of the Siberia Basin. Seismic reflection profiles show that a prominent subbottom basement ridge exists in the vicinity of Arlis Gap. The structure of the sediments suggests that the Siberia Basin has been free from deformation during the deposition of the sediments, except for possible broad crustal down warping. A crustal model based on the water depth measurements, seismic reflection profiles, gravity measurements, and magnetic measurements yields a crustal thickness of 15 km south of the buried ridge and 22 km under the ridge measured from sea level".

160 - LANDRY P. - "Mesures gravimétriques aux Iles Açores".
S.E.C.T. 49 p. (cartes). Paris. 1966.

Etude des résultats provenant des mesures franco-portugaises effectuées en 1965. Corrélations entre anomalies à l'air libre et altitudes, pour chaque île.

161 - LONCAREVIC B.D. - "Gravity, measurement of, at sea".
Encyclopaedic Dictionary of Physics. Pergamon Press. 6p. (L43)

General view on methods and instruments.

162 - LONCAREVIC B.D. - "Geophysical studies in the Indian Ocean".
Intern. Expedition. Admiralty. HMS Owen 1961. p.43-47. 1963.

"This article describes the results of the expedition of the HMS Owen to the Indian Ocean in 1961, a preliminary to the main British expedition, and discusses them particularly in the light of the drifting-continent theory".

For final results, see n°98 and 98bis in Bul. Inf. n°8, p.56.

163 - LONCAREVIC B.D. - "Accuracy of sea gravity surveys".
Nature, v.198, n°4875, p.23-24. 1963.

164 - LONCAREVIC B.D. - "Accuracy of sea gravity surveys : comparisons of shipboard and submarine gravity values".
Nature, v.205, n°4966, p.32-34. 1965.

Comparisons of 47 stations in Atlantic and Indian Oceans.

165 - LONCAREVIC B.D. - "Automatic acquisition of geophysical data".
Proc. ONR-NSIA Symposium on Automatic Collection, p.41-42. 1964.

"The geophysical information most suitable for automatic acquisition are the serial data representing the readings of underway instruments : the depth recorder, gravimeter and magnetometer and the nature of the ocean bottom (reflectivity, sub-bottom profiles..."

166 - LONCAREVIC B.D. - C.S. MASON. & D.H. MATTHEWS. - "Mid-Atlantic ridge near 45° North. I - The Median Valley".
Can. J. Earth Sci. v.3, n°327, p.327-349. 1966.

"Detailed maps of bathymetry, free-air gravity anomaly, and total field magnetic anomaly are presented for an area approximately 50 x 20 mi. along the crest of the ridge. The median valley and the associated belt of large positive magnetic anomalies are continous and display a striking lineation in direction 019°. The free-air gravity anomaly shows a strong resemblance to topography. This correlation disappears when the Bouguer anomaly is calculated, indicating that the intruisive body immediately underlying the median valley is not significantly different in density from those bodies beneath the elongated sea mounts which overlook the valley. Small variations in the Bouguer anomaly indicate that there is an increase in density in a northwest direction across the survey area. Magnetic anomalies within the surveyed area can be simulated by a two-dimentional model in which steeply dipping contracts separate blocks of rock having different magnetizations. These blocks could be entirely within the volcanic layer extending to a depth of 5 km below sea level, but the central block, underlying the median valley, must be much more strongly magnetized than those adjacent to it. The mechanism by which the valley was formed remains obscure".

167 - NEIDELL N.S. - "Spectral Studies of marine geophysical profiles". Geophysics. v.XXXI, n°1, p.122-134. 1966.

Gravity, magnetic, and echo-sounding data profiles from widely separated single-track surveys in the Atlantic and Indian Oceans were subjected to spectral studies. A two-dimensional sea floor with a recurring structural pattern seemed a model able to explain the computed results. In testing the model, the most important quantity to be determined from the spectra was the "ripple frequency" or interpeak interval. During the course of this work, a number of practical problems connected with the computation of spectra were considered. In addition, the spectral methods were also shown to be tools capable of investigating more complex geophysical theories. The experience and techniques of this investigation can be of value in treating analogous problems which arise in geophysical exploration".

168 - OPSTAL Van.L.H. - "Procedure followed during "NAVADO III" on board H. Neth M.S. "Snellius".
Hydro. Dept. Royal Netherlands Navy. 9 p. 1965.

Note : An outline of the topics discussed at the NAVADO wash-up meeting held at the Hague (Sept. 21.1965) is given in :
NAVADO III, final report (restricted). 15 p. 1965.

169 - ORLIN H. - B.C. BASSINGER & C.H. GRAY. - "Cape Charles-Wallops Island, Virginia, Off-shore gravity range".
J. Geophys. Res. v.70, n°24, p.6265-6267. 1965.
Summary of the publication mentioned hereafter.

170 - ORLIN H. - B.C. BASSINGER & C.H. GRAY. - "Gravity equipment evaluation range Cape Charles-Wallops Island, Virginia".
U.S. C&GS. - U.S. NAVOCEANO. 24p. 1965.

"This report describes an ocean gravity meter test range established in May 1965 through the cooperative efforts of the U.S. Department of Commerce, Environmental Science Services Administration, Coast & Geodetic Survey and the Department of Defense, U.S. Naval Oceanographic Office. The range, part of larger survey to be incorporated in an Upper Mantle investigation, was established to provide operational testing facilities for the evaluation of continous reading sea and airborne gravity meters. The completed project consists of 173 underwater stations spaced over 4800 mi^2. The density distribution is greatest in the vicinity of Cape Charles, Va., (45 stations in 225 mi^2) followed by the Wallops Island region (17 stations in 225 mi^2). This report summarizes the operations and presents data in the vicinity of both of these locations. Tables of gravity data and a gravity contoured chart are included".

171 - PAOLA L. - "Aspetti della ricerca oceanografica contemporana".
Boll. Geofis..teor. appl. v.VII, n°25, p.6-24. 1965.

"The importance of the oceanographic research is outlined, and the recent progresses illustrated, with special reference to the situation in the different Countries and in Italy".

172 - PLAUMANN Von S. - "Kontinuierliche Schweremessungen im Rotten Meer mit einem Askania-Seegravimeter vom Typ Gss 2 nach GRAF".
Z. Geophys. Jg.29, H.5, S.233-256. (Bouguer anomalies map). 1963.

Since about the turn of the century it is known that in the Red Sea graben positive Bouguer-anomalies of more than 100 mGal exist. Up to now, however, only few pendulum measurements have been performed, and mostly at the coasts and on isles. Today areal gravity measurements on seas are facilitated by the aid of the sea-gravimeters, which are available since some years. This paper is dealing with the results of measurements conducted in the Red Sea with an Askania sea-gravimeter in 1961. A gravity maximum has been found which is stretching along the center line of the Red Sea and in some places reaches

150 mGal. Interpretation is based on the assumption that subcrustal magma intruded into the earth's crust. The accuracy of the gravity measurements and of the corrections is discussed. It is shown that a deficient accuracy of navigation generally forms the main source of error. Neglect of the topographical corrections may entail relatively large errors ; detailed isobathic maps must be available to compute these corrections".

173 - ROBERTSON E.I. - "Gravity base stations in the South-West Pacific Ocean". N.Z. J. Geol. Geophys. v.8, n°3, p.424-436. 1965.

"Since 1950, gravity base stations have been established in the South-West Pacific Ocean area by G.P. WOOLLARD's group at the University of Wisconsin, P. STAHL of France, and the New-Zealand Department of Scientific and Industrial Research. Full details, including free-air and Bouguer anomalies, are given for bases in the Auckland, Cook, Fiji, Kermadec, Macquarie, New Caledonia, Samoa, Society, Tokelau, and Tonga Islands".

174 - ROUILLON G. - "Mesures en Polynésie".
Texte provisoire photocopié, 94 p. 1964.

Liste des stations gravimétriques occupées en 1957 et 1959, avec le Worden 332 au retour des campagnes de Terre Adélie. Dans les iles Fidji de la Société, les iles du Vent (Tahiti-Moorea), les iles sous le Vent (Raiatea, Takaa, Bora-Bora) et les iles Tuamotu.

175 - TALWANI M. - X. LE PICHON & M. EWING. - "Crustal structure of the Mid-Ocean ridges. II - Computed model from gravity and seismic refraction data".
J. Geophys. Res. v.70, n°2, p.341-352. 1965.

"Seismic results have demonstrated that the crust under the Mid-Ocean ridges is not thicker than under the ocean basins. Seismic results also show that the velocity in the mantle immediately under the ridge flanks is normal but that it is low under the axial zones, indicating an anomalous mantle. The free-air gravity anomaly over the entire ridge is close to 0 (within $\pm$ 50 mGal), and consequently the gradients in the Bouguer anomaly are steep (sometimes approaching 1 mGal/km). In order for gravity and seismic results to agree, the anomalous mantle, which provides compensation in the axial zone of the ridge, is postulated to extend to the flanks below the normal mantle observed by seismic refraction measurements. A model computed on the basis of continuous gravity measurements over the Mid-Atlantic ridge and the seismic refraction results given in part I is presented.

Alternative models that provide compensation at greater depth under the ridge flanks are ruled out by the steep gradients in the Bouguer anomaly. It is shown that a similar model can explain the seismic and gravity data obtained over the east Pacific rise but that a deeper compensation is not impossible because of the smaller gradients in the topography and Bouguer anomaly curves. A lack of correlation between the sharp east Pacific rise heat-flow anomalies and the magnetic and gravity anomalies is also noted".

Note : This paper is the second of a serie of papers on the Mid-Ocean ridge system. Parts I & 3 are respectively :
LE PICHON X. & others.I- Seismic refraction measurements.
J. Geophys. Res. v.70, n°2. 1965.
HEIRTZLER J.R. & X. LE PICHON. 3 - Magnetic anomalies over the Mid-Atlantic ridge.
J. Geophys. Res. v.70, n°16, p.4013-4033. 1965.

176 - THYSSEN-BORNEMISZA S. - "Double-track profiling with the gravity meter".
Geophysics. v.XXX, n°6, p.1135-1137. 1965.

"This technique, providing, simultaneously, gravity values and horizontal gravity gradients, is briefly discussed because of its possible advantage in marine exploration using the underwater gravity meter. Operating these remote-control meters at greater depth is rather cumbersome and costly if compared to surveys at the ground surface (Dobrin, 1960). However, a profile of average horizontal gradients, in addition to a regular gravity profile, would indicate positive or negative anomalies located away from the profile itself, and would help avoid gravity stations with insignificant interpretative value".

177 - THYSSEN-BORNEMISZA S. - "Possible application of the anomalous free-air vertical gradient to marine exploration".
Geophysics. v.XXXI, n°1, p.260-263. 1966.

"...It does not seem too difficult to correlate observations at sea surface and sea floor and to determine accurately the vertical interval between profiles located in a vertical or near to vertical plane. Of course, these twin only actual experimental proceedings could show the possible value of the suggested marine gradient technique".

178 - THYSSEN-BORNEMISZA S. - "Correlating sea-surface and aerial gravity measurements".
Geophysics. v.XXXI, n°1, p.264-266. 1966.

179 - TOMODA Y. - K. OZAWA. & J. CEGAWA. - "Gravity measurement in the Indian Ocean".
Bul. Geogr. v.X. Part I, 53 p. 1964. Japan.

"General view of programm and results in the "International Indian Ocean Expeditions in 1963-64" gravity at sea was continously measured by use of a ship borne gravity meter "T-S-S-G-3". Different from LaCoste's surface ship gravitymeter or Askania Gss, the gravitymeter is a small string gravity meter mounted on a vertical gyroscope, and vertical acceleration is precisely given digitally on punched tapes. The result of these computation are kept on the punched tapes for easy computation of free-air or Bouguer reduction".

180a- U.S. DEPT. of COMMERCE. - "International Indian Ocean expedition, U.S. C&GS Ship Pioneer - 1964".
Volume I - Cruise narrative and scientific results.
U.S. C&GS. 139 p. 1965.

180b- U.S. DEPT. of COMMERCE. - "International Indian Ocean expedition U.S. C&GS Ship Pioneer - 1964".
Volume II - Data report - Oceanographic stations, BT observations and bottom samples. U.S. C&GS. 183 p. 1965.

"The International Indian Ocean expedition was the first major cooperative effort on the part of many nations to study one of the scientifically least-known areas of the world, the Indian Ocean and adjacent seas. Some 20 nations and more than 40 ships participated in this work from 1962 through 1965...

The results of the C&GS ship Pioneer's 1964 cruise to the Indian Ocean are presented in the U.S. Environmental Science Services Administration's series of publications entitled "International Indian Ocean Expedition, USC&GS Ship Pioneer - 1964". Volume I of the series, Cruise Narrative and Scientific Results, gives the account of the 1964 Pioneer field operations, summarizes the data obtained, and presents preliminary scientific findings of the cruise. This second volume contains the oceanographic station data, bathythermograph log sheets, and field description of bottom samples. At the time volumes 1 and 2 were being prepared, further analyses of geological and biological samples, processing of trackline gravity and magnetic measurements, and interpretative studies of all observations were underway. The Pioneer's 1964 cruise covered 31,507 nautical miles from San Francisco, Calif., across the North Pacific Ocean, through the South China and Andaman seas, Bay of Bengal, northeast Indian Ocean, Java and Celebes Seas, and again across the North Pacific to San Francisco. During the 6-month cruise from February 11 to August 11, 1964, the Pioneer made stops at Honolulu, Hawaii (en route and returning), Manila, Republic of the

Philippines ; Jesselton, Singapore, and Penang, Malaysia ; Calcutta, India ; Colombo, Ceylon ; Ko Phuket, Thailand ; Djakarta, Republic of Indonesia ; and at the Palau Islands and Guam in the western North Pacific..."

"A total of about 26,000 nm of gravity trackline was mas made. The reduced gravity values and magnetic data, taken at 5 minute intervals, will be tabulated in another volume of this serie. Part of the data in the Andaman Sea area have been utilized in a geological study". (v. I, p.91-107)

181 - VAJK R. - "Correction of gravity anomalies at sea for submarine topography".
J. Geophys. Res. v.69, n°18, p.3837-3844. Palisades, N.Y. 1964.

"It is suggested that the correction of sea gravity data for submarine topography be computed for a datum surface coinciding with the surface of a standard oceanic crust, and with the surface of a "standard type" continental margin. The standard type continental margin is a transitional zone between the standard continental and oceanic crusts. Every column of it, including the upper part of the mantle down to the isopiestic level, is in isostatic equilibrium with similar columns of the standard continental and oceanic crusts. Two models of the standard type continental margin are given. Sea gravity anomalies reduced in the manner given in the paper are called "modified free-air anomalies". They are free of the gravity effect of submarine topography consequently they represent the gravity effects of the deviations of the actual crust from the standard crust. Over continental margins a correction for the edge effect of the continent must be applied. A unified world-wide isogal map over continents, oceans and continental margins can be constructed by using Bouguer anomalies on land and modified free-air anomalies over the sea if both types of anomalies are corrected for the edge effects of the continents. The modified free-air anomalies are directly related to the deviations of the actual crust from the standard crust, thus the interpretation of sea gravity data is simplified. The interpretation of modified free-air anomalies along a profile is illustrated by an example".

182 - VENING MEINESZ F.A. - "Mantle currents below the Mediterranean areas".
Proc. Kon. Nederl. Akad. Wetensh. Ser. B, v.67, n°3, p.215-219. 1964.

"In a previous paper, the writer made an attempt to conjecture the pattern of convection currents in the Earth's mantle during the present and most recent periods. This attempt is based on the generally accepted supposition that rising current occur below the Mid-Ocean ridges, which in the upper mantle usually flow off towards both sides, and that they also may occur under the border areas of the

continents, flowing off towards the ocean side and subsiding below the adjacent oceanic belts".

In this paper, the writer makes a similar attempt for the Mediterranean area".

183 - VENING MEINESZ F.A. - "Interpretation of gravity anomalies on the Westcoast of South America and in the Caribbean & the Puerto Rico trench ; two types of deep Ocean trenches".
Netherl. Geod. Comm. v.2, n°1, p.5-28. 1964.

184 - VENING MEINESZ F.A. - "Origin of the crustal structure of the Mid-Ocean ridges".
Proc. Kon. Nederl. Akad. Wetensh. Ser. B, v.68, n°3, p.114-116. 1965.

"The writer thinks that a plausible hypothesis can be given for the anomalous mantle in the North Middle Atlantic Ridge.

This hypothesis starts from the widely accepted view that the Mid-Atlantic ridge, as well as other mid-ocean ridges, is caused by the rising limb of a convection-current system throughout the whole mantle, which is brought about by the cooling of the Earth at its surface".

185 - VENING MEINESZ F.A. - "The area where the two parts of the Alpine Himalayan geosyncline meet each other".
Proc. Kon. Nederl. Akad. Wetensh. Ser. B, v.69, n°1, p.55-57. 1966.

The writer thinks that "an important contribution to the understanding of the crustal deformation in the Grecian Archipelago between the Peleponnesus and Cyprus is given by the study of the gravity anomalies in this area..."

He interprets the map of isostatic gravity anomalies (Airy, 30 km) reprinted from U. FLEISCHER (see n°147 above).

186 - WORZEL J.L. - "Pendulum gravity measurements at sea 1936-1959".
Lamont Geol. Obs. Columbia Univ. 422 p. Palisades, N.Y. 1965.

"This indispensable reference records for the first time 3,000 new gravity measurements made with pendulums in submarines - 2/3 of all the measurements ever made. It serves, therefore, as a framework upon which surface ship observations can build, and represents a first view of the structure of what has been called the normal part of our planet - the ocean. The observations are arranged so that they can be found either by cruise of by geographical area. Base stations

are detailed in a special section.

Another outstanding feature is the presentation of all the gravity observations taken to date superimposed on the oceanic topography (both as free-air and as Bouguer anomalies) on charts suitable for mounting as a composite world chart. Interpretations of these data are given from both a geodetic and structural view of the world.

Dr. WORZEL gives special attention to the physics of the measurement techniques. Apparatus modifications and improvements are detailed, and the resulting geodetic, geophysical, and geological implications are discussed at length".

Voir aussi n°109 - 113 - 114 - 115 - 131.

Ces publications ont été classées sous la rubrique "Appareils" car elles traitent surtout de la précision des résultats.

LISTE DES PUBLICATIONS

reçues au

BUREAU GRAVIMETRIQUE INTERNATIONAL

(Oct. 1965 - Sept. 1966)

CONCERNANT LES QUESTIONS DE PESANTEUR

LISTE DES PUBLICATIONS

* 1031 - BURSA M. - "Theory of determination of position of centre of reference ellipsoid from observations of Earth satellites".
Studia Geophys. & Geod. n°9, p.225-229. Prague. 1965.

1034 - ZIELINSKI J. - "Contributions of satellite method to the gravimetrical and geometrical measurements".
Bull. Géod. n°76, p.135-144. 1965

RAMSAYER K. - "The admissible distances of the gravity points for the determination of geopotential numbers in high mountains, medium high mountains and flat countries".
Bull. Géod. n°76, p.145-150. 1965

1035 - GERMAN Von S. - "Die Waage im inhomogenen Schwerefeld".
Feinwerktechnik. n°64. 10. p.355-360. 1960.

1036 - GERMAN Von S. - "Das Quecksilber-Barometer im inhomogenen Schwerefeld".
Z. Instr. 69. H.9, S.254-255. 1961.

1037 - JUNCOSA M.L. & K.C. JOHNS... -"A chebyshev approximation to the Earth's external gravipotential with internally unrestricted mass distribution".
Memorandum RM-4677-PR. 28 p. Saint-Monica, California. 1965.

1040 - CIGAS E. - "Festsitzung anlässlich der Verabschiedung".
Deutsche Geod. Kommiss. R.E. H.5. 60 S. Frankfurt. 1965.

1041 - SIMONSEN O. - "Global aspect of the astronomical correction for levelling of high precision when considering the definition of levelling datum".
Dan. Geod. Inst. 233 p. Copenhague. 1965.

1043 - BERANEK B. - "Quantitative interpretation of local gravity anomalies for case of circular cylinder with vertical axis".
Studia Geophys. & Geod. n°9, 4. p.319-330. Prague. 1965.

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* **La numérotation n'est pas suivie car les publications ne se rapportant pas aux questions de pesanteur n'ont pas été indiquées.**

1044 - DEWART G. & M.N. TOKSOZ - "Crustal structure in East Antarctica from surface wave dispersion".
Geophys. J. v.10, n°2, p.127-139. 1965.

COOK A.H. - "On the determination of the even zonal harmonics in the external gravitational potential of the Earth".
Geophys. J. v.10, n°2, p.181-200. 1965.

1046 - BULL. GEOGR. SURV. INST. - "Gravity survey in Japan - III - Gravity survey in the Kantō and Chūbu districts".
v.IX, parts 3-4, 339 p. Japon. 1964.

1047 - TOMODA Y., K. OZAWA & J. CEGAWA. - "Gravity measurement in the Indian Ocean".
Bull. Geogr. Surv. Inst. v.X, part I, 53 p. Japon. 1964.

1048 - NAKAGAWA I. - "On the M_1 - component obtained by gravimetric tidal observation". (Screening of gravitational forces).
Geophys. Inst. n°4, p.9-17. Kyoto Univ. 1964.

TANAKA Y. - "Relation between crustal and subcrustal earthquakes inferred from the mode of crustal movements".
Geophys. Inst. n°4, p.19-28. Kyoto Univ. 1964.

WADA T. & K. KAMO - "A simplified model of upper crust from seismic wave velocities at volcano Aso".
Geophys. Inst. n°4, p.91-104. Kyoto Univ. 1964.

1051 - RUDMAN A.J. & R.F. BLAKELY - "A geophysical study of a basement anomaly in Indiana".
Geophysics. v.XXX, n°5, p.740-761. 1965.

1052 - RECHENMANN J. - "Mission géophysique 1958-1962. Mesures gravimétriques et magnétiques en Côte d'Ivoire, Haute-Volta et Mali Méridional".
O.R.S.T.O.M. Cahiers, n°5, 43 p. 1965.

1053 - SAXOV S. - "Some gravity measurements in Sønderjylland".
Geod. Inst. Skrift. 3ème série, t.36, 57 p. Copenhague. 1965

1054 - PRODEHL C. - "Struktur der Tieferen Erdkruste in Südbayern und Längs eines Querprofiles durch die Ostalpen, Abgeleitet aus Refraktionsseimischen Messungen bis 1964".
from : Boll. Geof. teor. appl. v.VII, n°25, p.35-88. 1965.

1056 - MELCHIOR P. - "Station : Sclaigneaux II".
Bull. d'Obs. Marées terrestres. v.III, fasc. II, 24 p. Bruxelles. 1965.

1057 - MELCHIOR P. - "Bibliographie 1962-1965".
Commiss. Permanente des Marées terrestres. Obs. R. Belg. 192 p. Bruxelles. 1965.

1058 - MELCHIOR P. - "Bull. d'Inform. Marées terrestres", n°42, p.1566-1609. Bruxelles. 1965.

1059 - WERNTHALER R. - "Berichte Uber Nivellement und Krustenbewegungen zur Vorlage beim Zweiten Symposium der I.U.G.G. Kommission für Rezente Krustenbewegungen vom 3 bis 7. August 1965, in Aulanko - Finland".
Deutsche Geod. Kommiss. R.B, H. 125, 32 S. München. 1965 .

1060 - GEMAEL C. - "Cartas de reduçao topo-isostatica para o estado de Sao-Paulo".
Bol. Univ. Parana. Geod. n°9, 3 p. 1965

1061 - BULL. GEOGR. SURV. INST. - "Gravity survey in Japan - IV - Gravity survey in the Chubu, Kinki and Chugoku districts".
v.X, parts 2-4, 183 p. Japon. 1965.

1062 - BOTT M.H.P. - "Gravity measurements in the North-Eastern part of the Irish Sea".
from : Quart. J. Geol. Soc. v.120, p.369-96. 1964.

1063 - WYRZYKOWSKI.T.- "The application of precise levelling to the determination of the recent vertical movements of the Earth crust and its influence on the levelling results and errors determined".
Prace Inst. Geod. Kartogr. t.XII, v.25, p.80-83. Warszawa. 1965.

1064 - Recherches sur la construction d'appareils gravimétriques.
TRUDY CNIIGAIK, n°159, 84 p. 1964. (en russe)

a) HEJFEC M.E. - "Quelques problèmes de la théorie d'oscillation des pendules sur une plateforme horizontale mobile".
p.5-27.

b) MALAHOV B.M. - "Travaux expérimentaux avec un appareil pendulaire sur un navire de surface".
p.29-60.

c) SLIVIN Ju. A. - "Enregistrement photo-électronique de la période d'oscillation d'un pendule et de ses amplitudes".
p.61-78.

d) KOGAN M.G. & Ju A. SLIVIN - "Sur le problème de la constance de la période d'oscillation du pendule gravimétrique".

1065 - PANACENKO G.D. - "Observations d'inclinaison...
Acad. Sci. U.R.S.S. 122 p. 1965. (en russe)

1066 - CARROZZO M.T. - C. MORELLI & G. POMODORO - "The horizontal second derivative of g in the gravimetric interpretation".
Boll. Geofis. teor. appl. v.VII, n°27, p.179-188. 1965

RICE D.A. - K.I. DAUGHERTY & B.L. DECKER - "Significance of a unified world gravity system".

1067 - O.R.S.T.O.M. - "Carte Anomalies de Bouguer, Afrique Occidentale".
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1068 - JABLONSKI H.M. - "Catalogue of primary gravity stations and excenter connections".
Aeronaut. Chart & Inf. Center. Spe. Pub. n°12, 442 p. Saint-Louis, Miss. 1964.

1069 - WHALEN C.T. - "The Euro-African calibration line". (E.A.C.L.)
APCS OPLAN 503; Phase Rep. n°2; 437 p; Orlando, Floride. 1965.

1071 - GERMAN S. - "Das Problem der Gravimeter-Kalibrierung".
Z. Instr. 71. H.9, S.255-260. 1963.

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1 - SALVIONI G. - "Anomalie di Faye e Bouguer su lunghi lineamenti".
Boll. Geod. Sci. Affini. n°1, p.82-88. 1966.

2 - PICHA J. - "Use of non-tidal effects from records of tidal observation in studying crustal movements".
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7 - BHATTACHARJI J.C. - "Modified form of Earth model gravity anomaly for use in Stokes's integral".
Geophys. J. v.10, n°3, p.221-229. 1965.

EINARSSON T. - "Remarks on crustal structure in Iceland".
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9-a) HAWKINS L.V. - J.F. HENNION - J.E. NAFE & R.F. THYER - "Geophysical investigations in the area of the Perth Basin, Western Australia".
Geophysics. v.XXX, n°6, p.1026-1052. 1965.

b) HALL D.H. & W.C. BRISBIN - "Crustal structure from converted head waves in Central Western Manitoba".
Geophysics. v.XXX, n°6, p.1053-1067. 1965.

c) FAJKLEWICZ Z.J. - "Fictitious anomalies of higher vertical derivatives of gravity".
Geophysics. v.XXX, n°6, p.1094-1107. 1965.

d) McCULLOH T.H. - "A confirmation by gravity measurements of an underground density profile based on core densities".
Geophysics. v.XXX, n°6, p.1108-1132. 1965.

e) HAMMER S. - "Density determinations by underground gravity measurements sequel".
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f) THYSSEN-BORNEMISZA S. - "Double-track profiling with the gravity meter".
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g) THYSSEN-BORNEMISZA S. - "Correlating vertical magnetic intensity and average horizontal gradients of gravity".
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10 - HEJFEC M.E. - "High precision pendulum measurements of gravity in the U.S.S.R".
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Geophys. Bull. n°16, p.92-96. Moscou. 1965.

11 - PLAUMANN Von S. - "Kontinuierliche Schweremessungen im Roten Meer mit einem Askania-Seegravimeter vom Typ Gss 2 nach GRAF".
Z. Geophys. Jg.29, H.5, S.233-256. Hannover. 1963.

15 - CONSTANTINESCU L. - L. RUPRECHTOVA & D. ENESCU. - "Mediterranean alpine earthquake mechanisms and their seismotectonic implications".
Geophys. J. v.X, n°4, p.347-368. 1966.

16 - WHALEN C.T. - "Extension of the American calibration line from Mexico to Ushuala".
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17 - WHALEN C.T. - "The West Pacific calibration line survey, 1964-65".
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19 - BREIN R. - "Ergebnisse der Schweregistrierungen mit Verwendung einer elektrischen Feder, 1962-1964".
Deutsche Geod. Kommiss. R.B. H.116, 90 S. Frankfurt. 1965.

22 - KNEISSL Max & Mac. - "Geodätische Feinmessungen zur Untersuchung der Standfestigkeit historischer Bauten".
Bayer. Akad. Wissensch. Math. Naturwissensch. H.120, 37 S. München. 1965.

23 - WIRTH Von H. - "Gekoppelte Systeme bei geophysikalischen Messgeräten".
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24 - ELSTNER Von C. - "Uber den Einfluss magnetischer Felder auf die Bewegung von Invarpendeln bei relativen Schweremessungen".
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28 - MAZZON C. & V. TOMELLERI - "Le nuove misure pendolari lungo la linea europea di taratura dei gravimetri".
Politecnico di Milano. n°147, 10 p. 1964.

29 - MAZZON C. & V. TOMELLERI. - "La campagna gravimetrica pendolare italiana nell'Africa Meridionale : resultati preliminari".
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35 - TOMELLERI V. - "Nuovo collegamento pendolare tra Milano e Roma".
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44 - MAZZON C. - "Le espressioni generali dello scostamento del geoide e della condizione di Villarceau".
Politecnico di Milano. n°164, 15 p. 1965.

45 - MAZZON C. - "Il nuovo registratore fotografico diretto dell'apparato tripendolare n°2 della Commissione Geodetica Italiana".
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47 - SIMONSEN O. - "Is the levelling datum for a continental levelling network so stable that it would permit the determination of secular movements as accurate as modern precise levellings may be observed"?
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48 - a) CARROZZO M.T. & C. MORELLI.- "On the definition of Bouguer anomalies referred to model Earth".
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c) GANTAR C. & C. MORELLI. - "Detail gravimeter measurements over the european calibration line in 1963". (O.G.S.T. & U.S.N.O.O.)
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d) WOLF H. - "On the numerical construction of a world-wide gravity net by adjustments and statistical methods".
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49 - a) NEIDELL N.S. - "Spectral studies of marine geophysical profiles".
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b) BIOT M.A. - "Three-dimentional gravity instability derived from two-dimensional solutions".
Geophysics. v.XXXI, n°1, p.153-166. 1966.

c) THYSSEN-BORNEMISZA S. - "Possible application of the anomalous Free-Air vertical gradient to marine exploration".
Geophysics. v.XXXI, n°1, p.260-263. 1966.

d) THYSSEN-BORNEMISZA S. - "Correlating sea-surface and aerial gravity measurements".
Geophysics. v.XXXI, n°1. p.264-266. 1966.

50 - KAARIAINEN E. - "The second levelling of Finland in 1935-1955".
Suom. Geod. Lait. Julk. n°61, 313 p. Helsinki. 1966.

53 - ARNOLD K. - "Eine deifache Ableitung des gravimetrischen Zusatzgliedes".
Gerlands Beitr. Geophys. n°74, H.3, S.207-211. 1965.

54 - WIRTH H. & L. SKALSKY. - "Freie Schwingungen des Erdkörpers". Gerlands Beitr. Geophys. n°74, H.3, p.230-232. 1965.

55 - NUDELMAN A.V. - "Soviet Antarctic expeditions 1961-1963". 267 p. Moscou. 1965. (en russe)

56 - U.S.A.F. - "Alphabetical listing of documents". Aeronaut. Chart & Inf. Center. DOD Gravity Library. 289 p. St-Louis, Mo. 1965.

57 - U.S.A.F. - "Quarterly accession list". Aeronaut. Chart & Inf. Center. DOD Gravity Library. 19 p. St-Louis, Mo. 1965.

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