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Surface radiation budget measurements during the BBLAST campaign

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1. Motivation

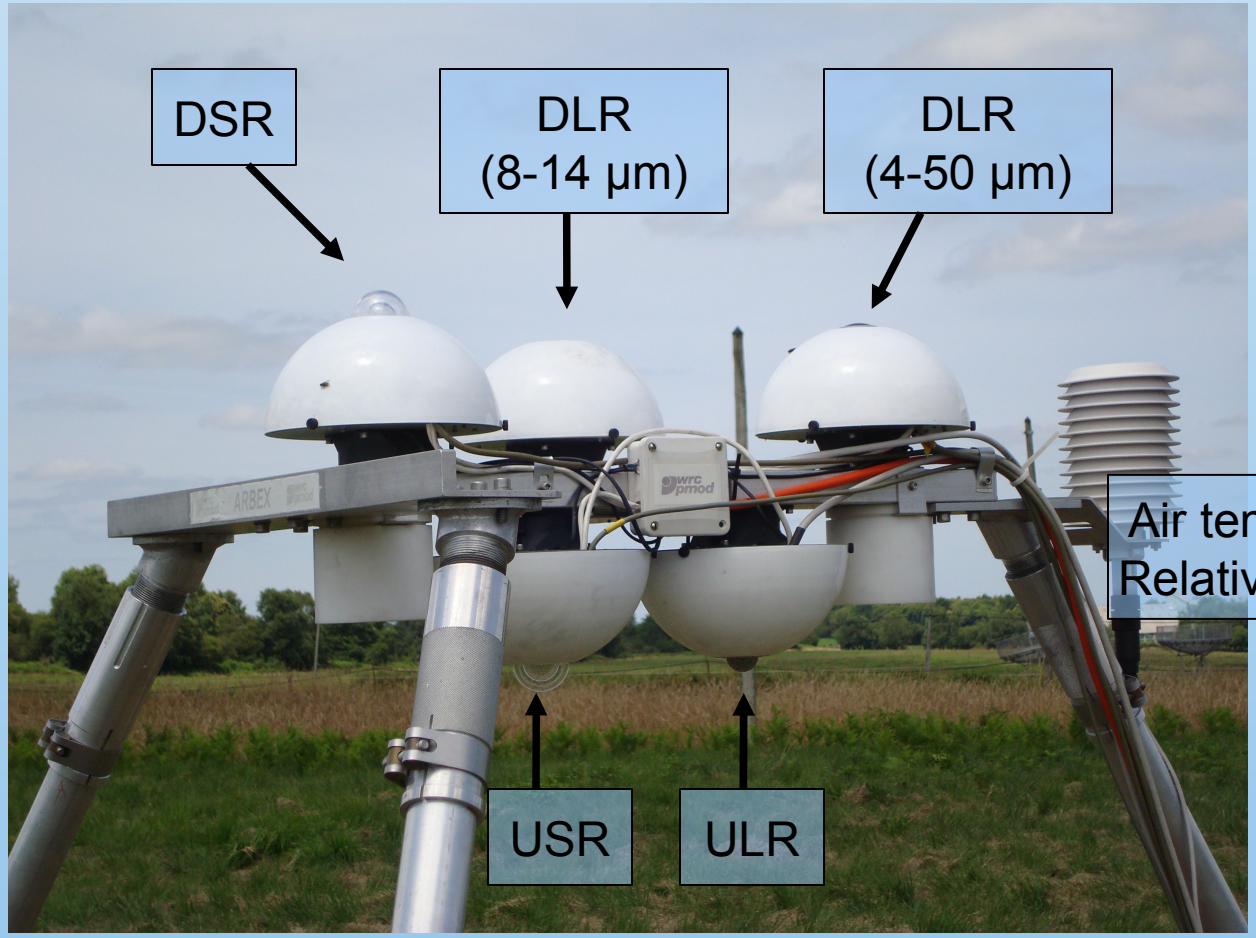
1. Provide high quality radiation measurements to study surface radiation/energy budget

2. Major goal of the BLLAST campaign is to make more and better observations of the LAT

We have developed a method to derive the effective radiating temperature of the PBL from long-wave radiation measurements (Gröbner et al., 2009).

2. Radiation products of PMOD/WRC

Instrumental Setup for BBLAST



Radiation products in Database

Parameter	Unit	Acronym
Down-welling short-wave radiation (DSR)	Wm^{-2}	pmod_dsr_
Down-welling long-wave radiation (DLR)	Wm^{-2}	pmod_dlr_
Down-welling long-wave radiation in main atmospheric window (8-14 µm)	Wm^{-2}	pmod_cgr3_
Upwelling short-wave radiation (USR)	Wm^{-2}	pmod_usr_
Up-welling long-wave radiation (ULR)	Wm^{-2}	pmod_ulr_
Net short-wave radiation	Wm^{-2}	pmod_netsw_
Net long-wave radiation	Wm^{-2}	pmod_netlw_
Net radiation	Wm^{-2}	pmod_net_
Atmospheric boundary layer temperature	°C	pmod_dtabl_

Data Availability:
(1-min. averages)

Divergence Site: 15. June – 16. June

Micro-scale Site: 16. June – 8. July

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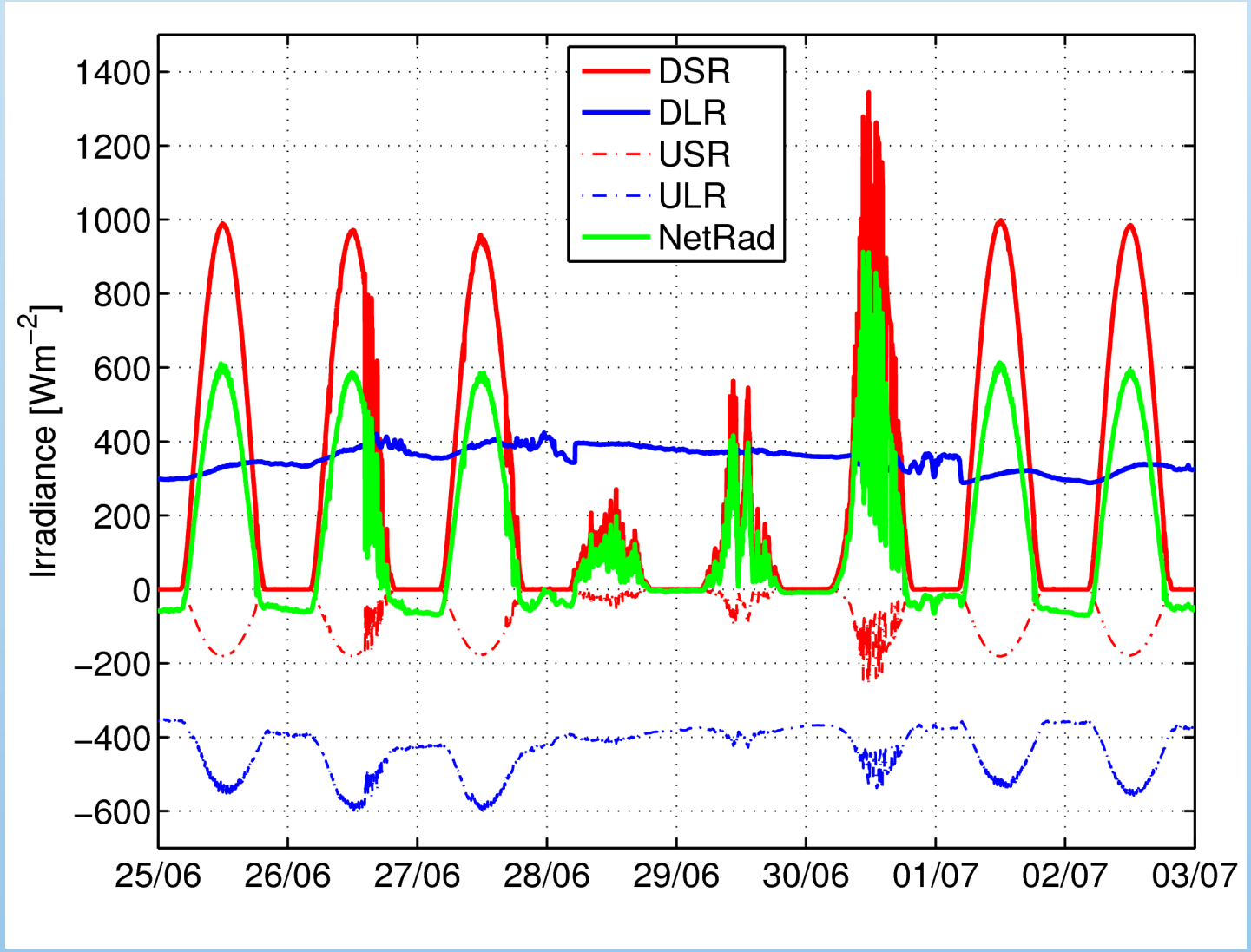
Radiation during BBLAST



Applications

High quality measurements for each component of the surface radiation budget can be used:

➔ Surface energy budget analysis:

$$DSR + DLR - USR - ULR = SH + LH + G$$

➔ Study of the cloud radiative effect (Cloud radiative forcing)

➔ Model validation

➔ Atmospheric boundary layer temperature (T_{ABL})

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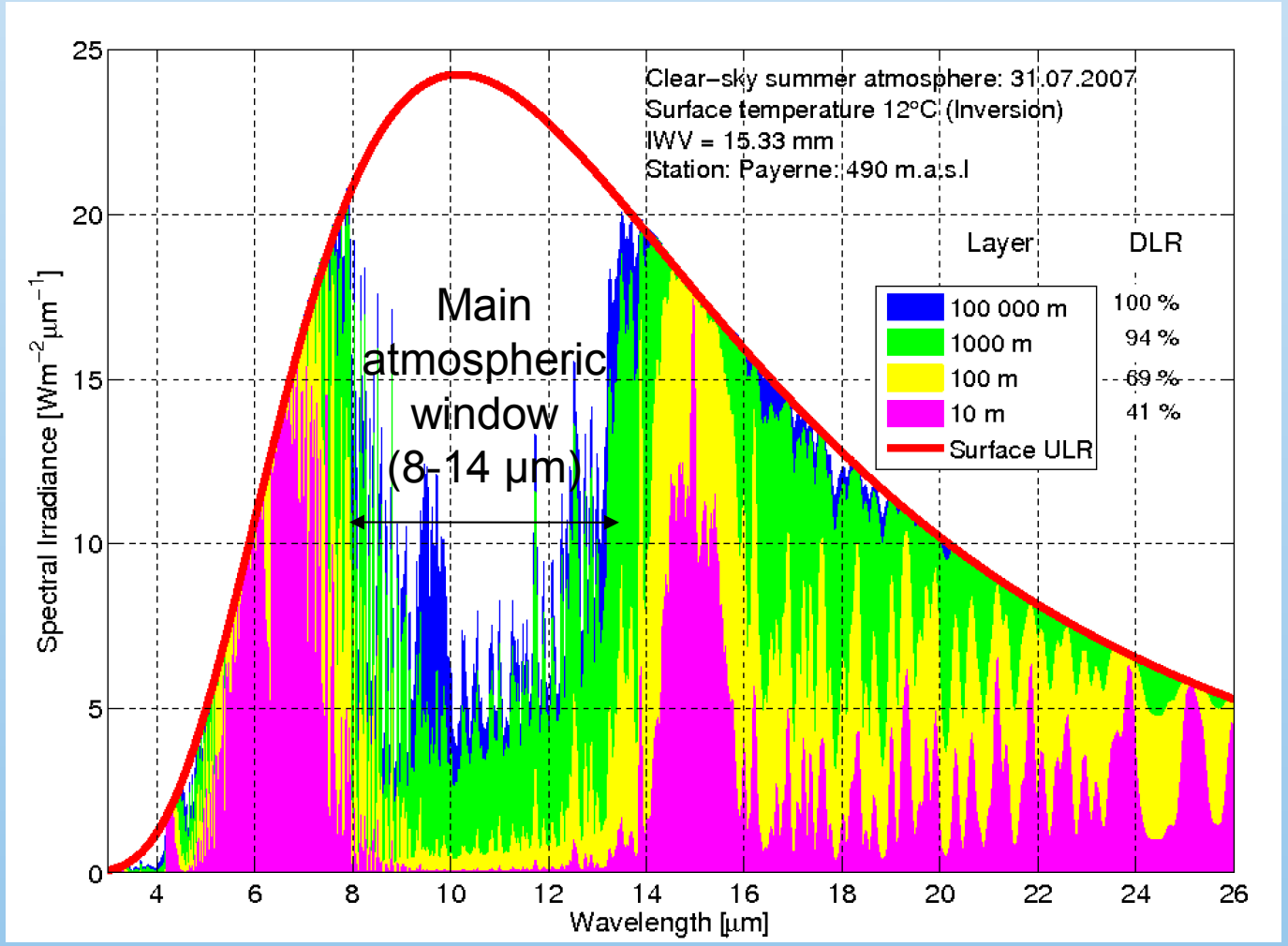
Part II

Temporally high resolved observations of the early morning and the LAT using long-wave radiation data

Method

Origin of down-welling long-wave radiation (DLR)

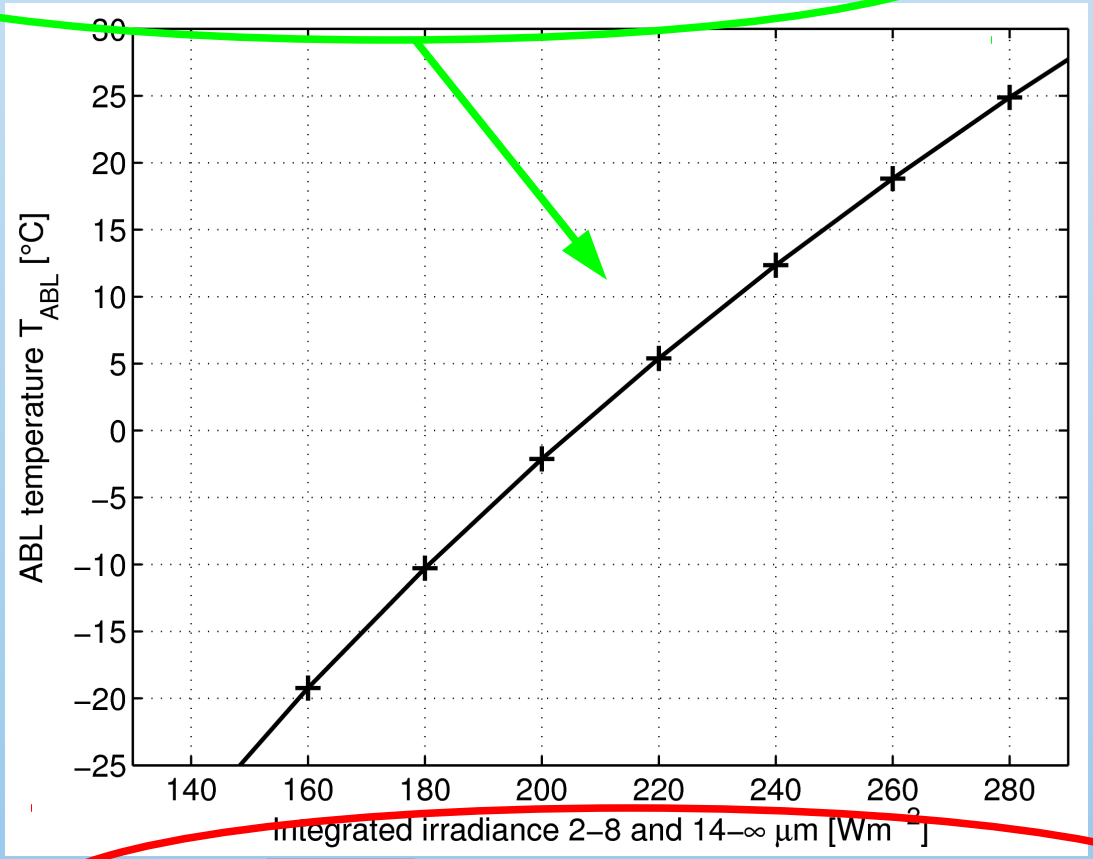


95 % of down-welling long-wave radiation originates from the first km --> PBL

Atmospheric boundary layer temperature (T_{ABL})

$$\int_{3\,\mu m}^{8\,\mu m} L_\lambda\left(T_{ABL}\right) d\lambda + \int_{14\,\mu m}^{\infty} L_\lambda\left(T_{ABL}\right) d\lambda = \Delta DLR'$$

L_λ: Planck function



can be measured

≈ ΔDLR' = DLR (2-100 µm) – DLR (8-14µm)

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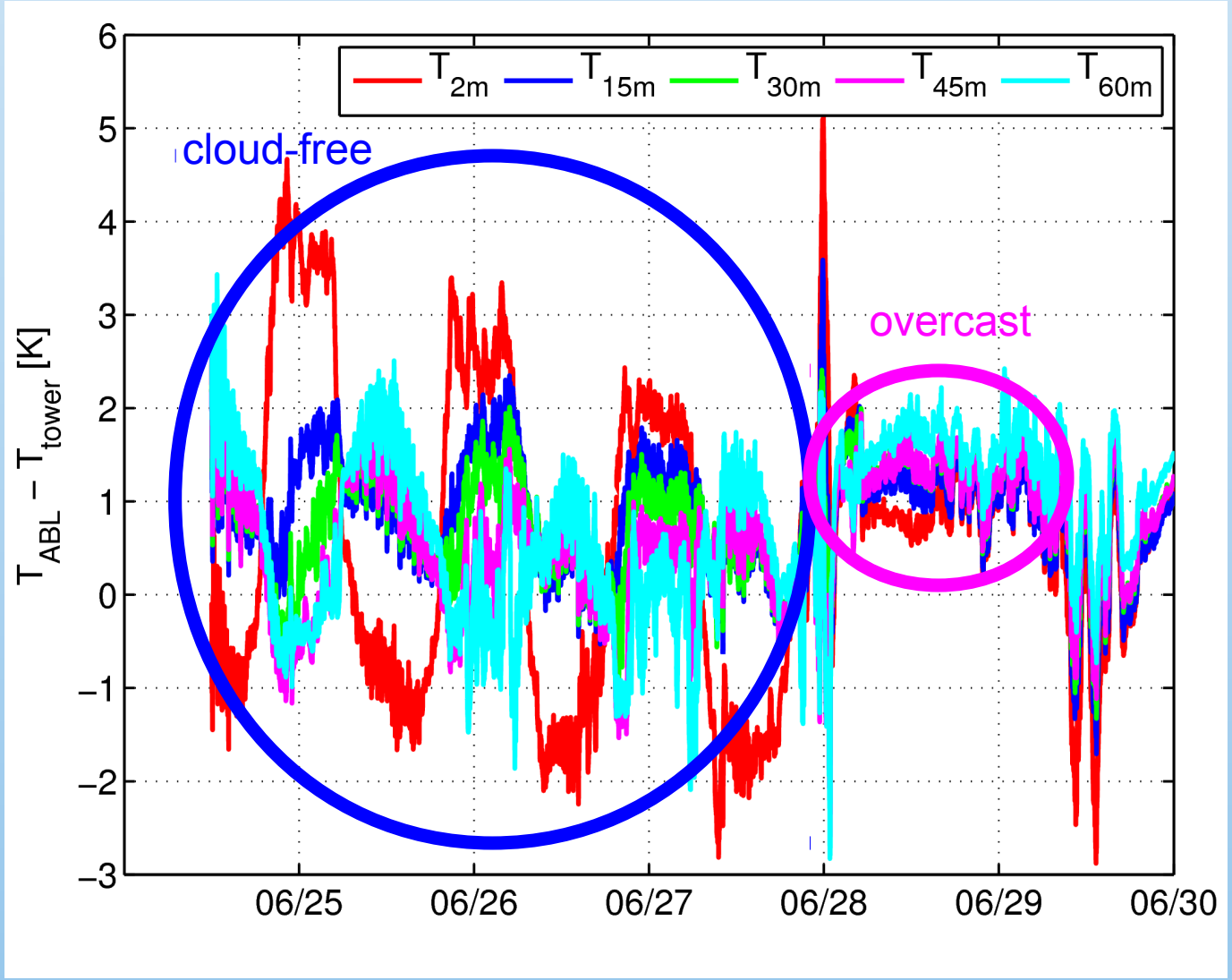
T_{ABL} with respect to temperatures measured on tower



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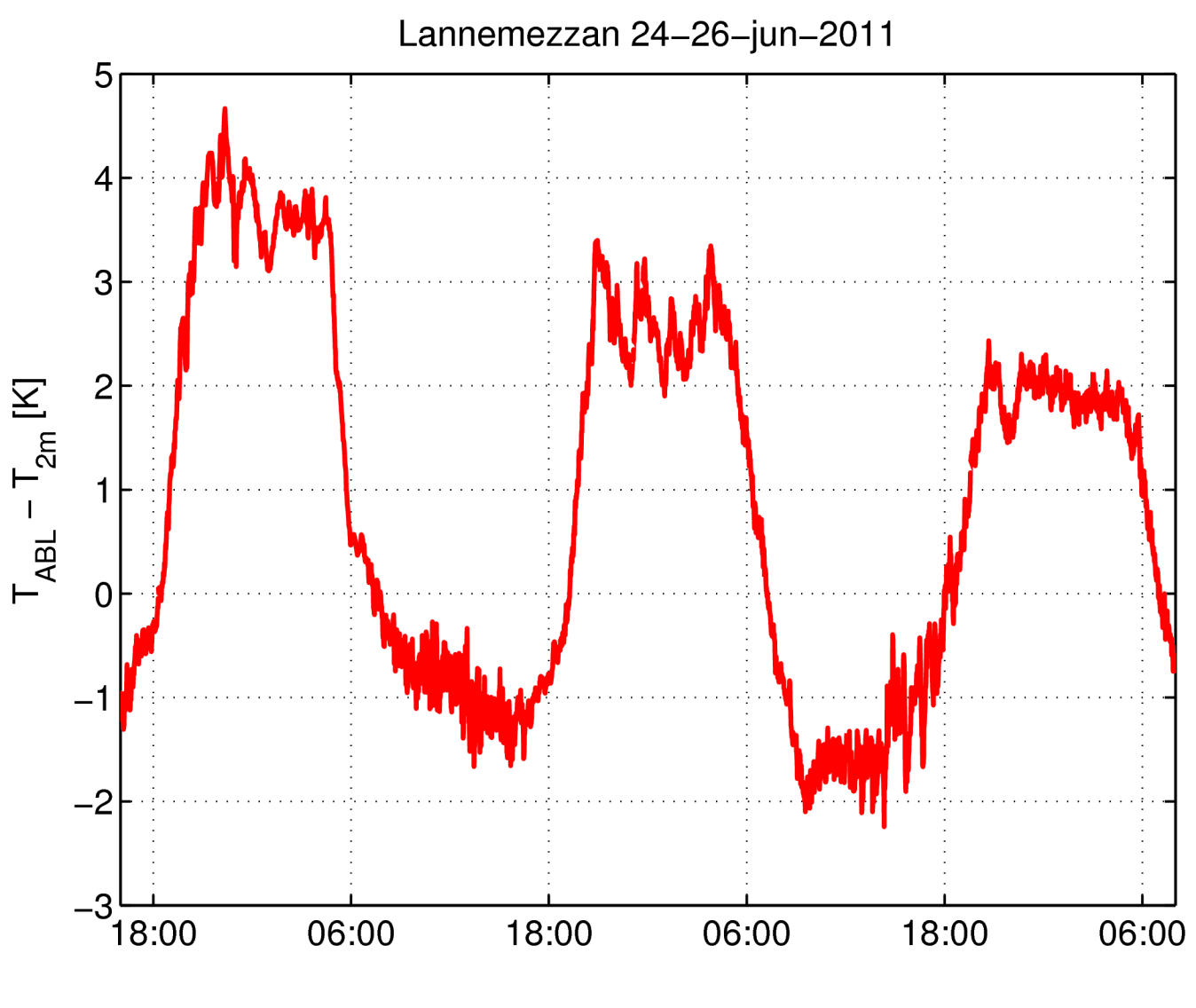
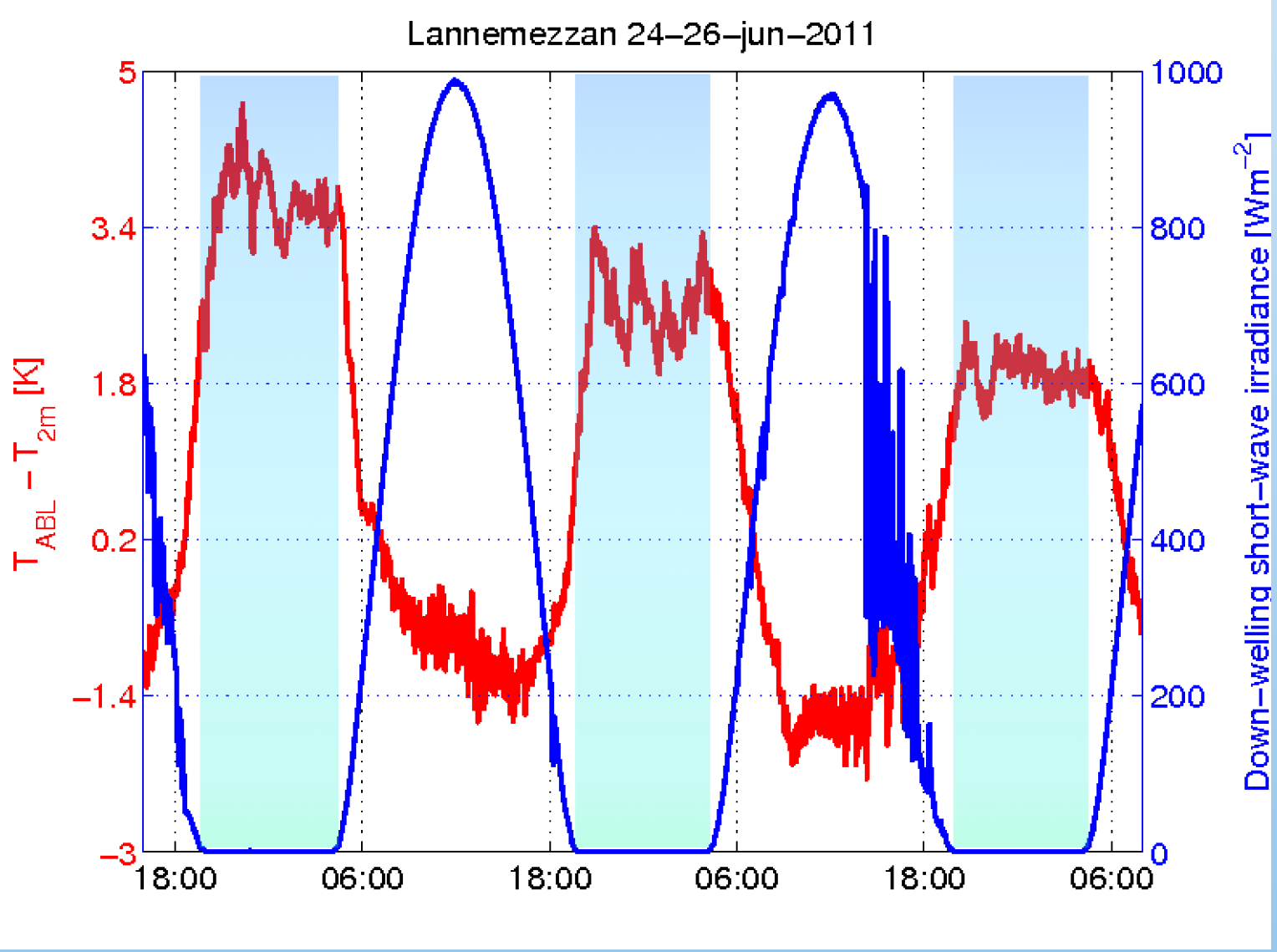
Observation of LAT



Observation of LAT



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Conclusions/Outlook

- High quality measurements of surface radiation budgets components and derived products on Super-Site 1 during the whole BBLAST campaign
- Validation and assimilation of products with data from other groups is appreciated

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