

Studies on Diffusion and Transport in TM5

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What will be presented here:

- Comparisons:²²²Rn transport simulations and observations features of the seasonal diurnal cycle
- BLH: Simulated and observed BL at Cabauw
- Snapshots of diffusions experiments run with TM5

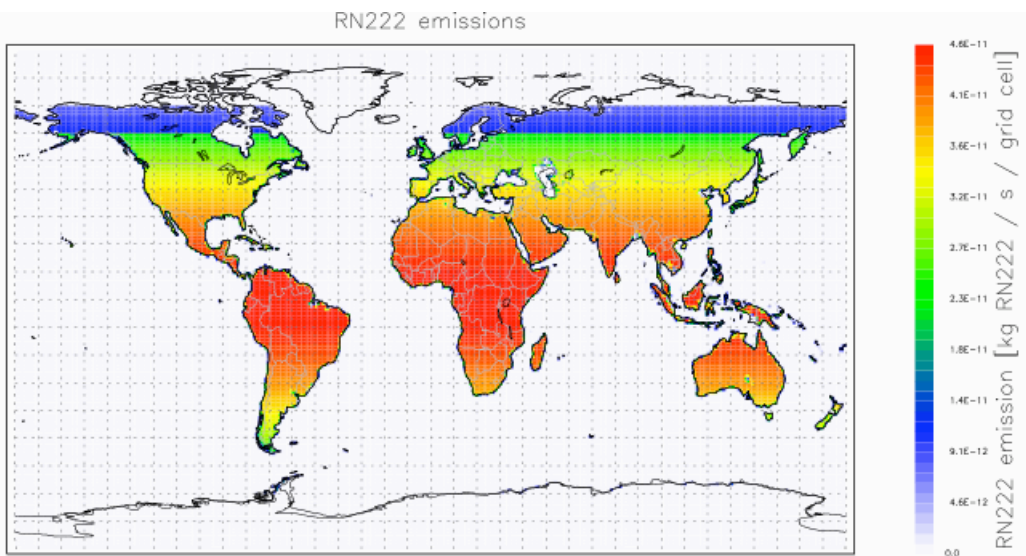
Characteristics:

- TM5 v25 – 25 vertical layers

Year 2005

Global domain 6x4 deg + zoom over Europe (3x2 and 1x1 deg)

222RN inventory: standard



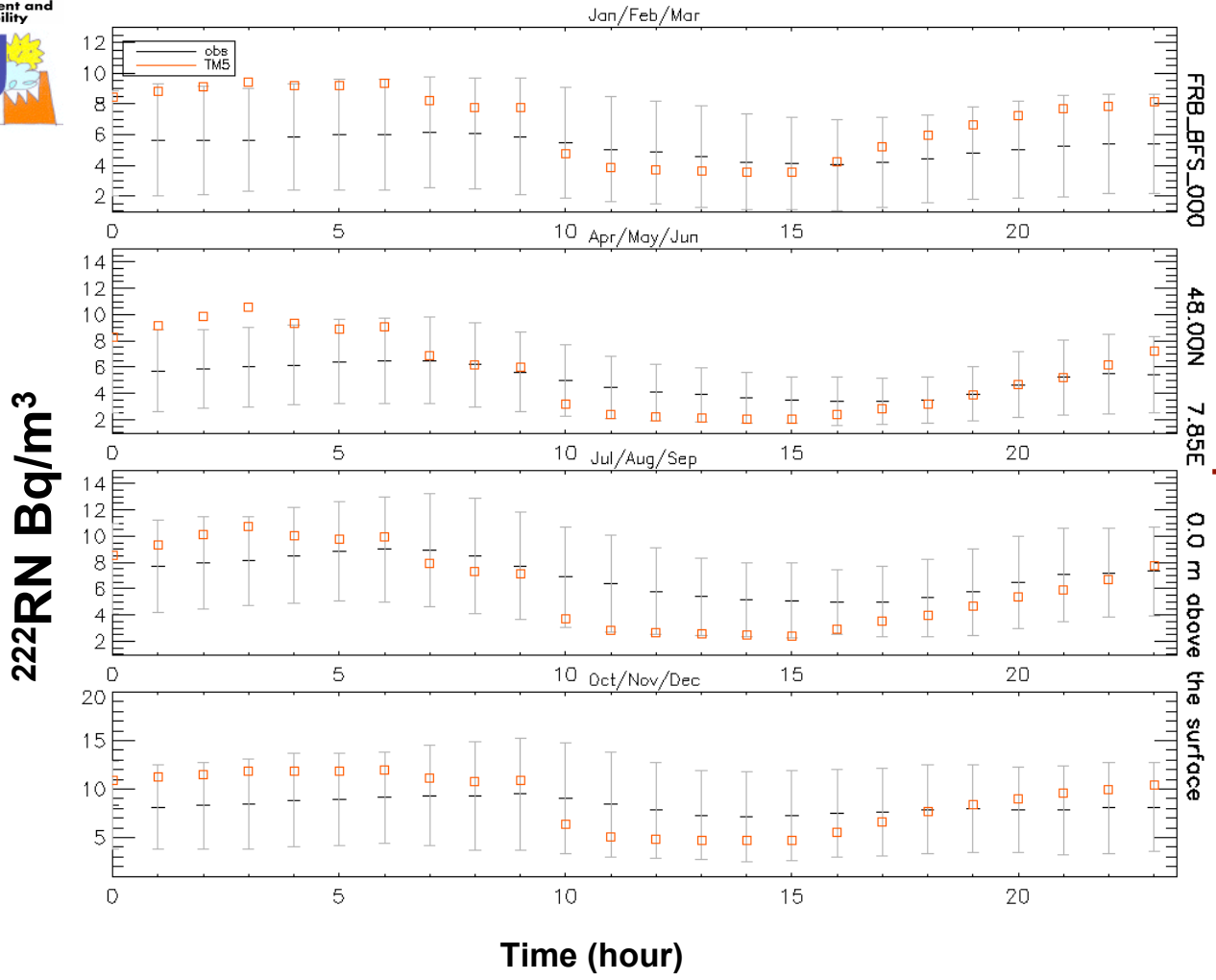
- Locations here considered:

Freiburg
Saclay
Milan

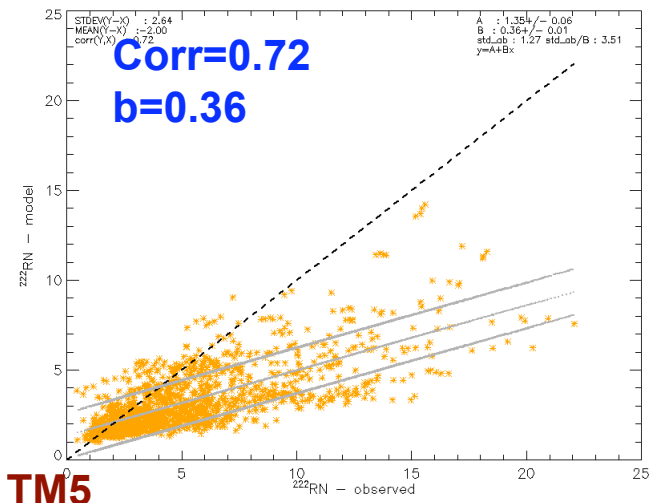


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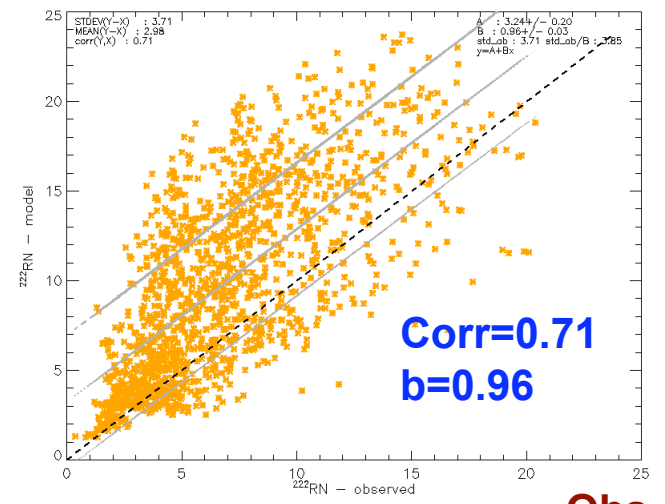
²²²Rn diurnal cycle



day 12-15 hh



TM5



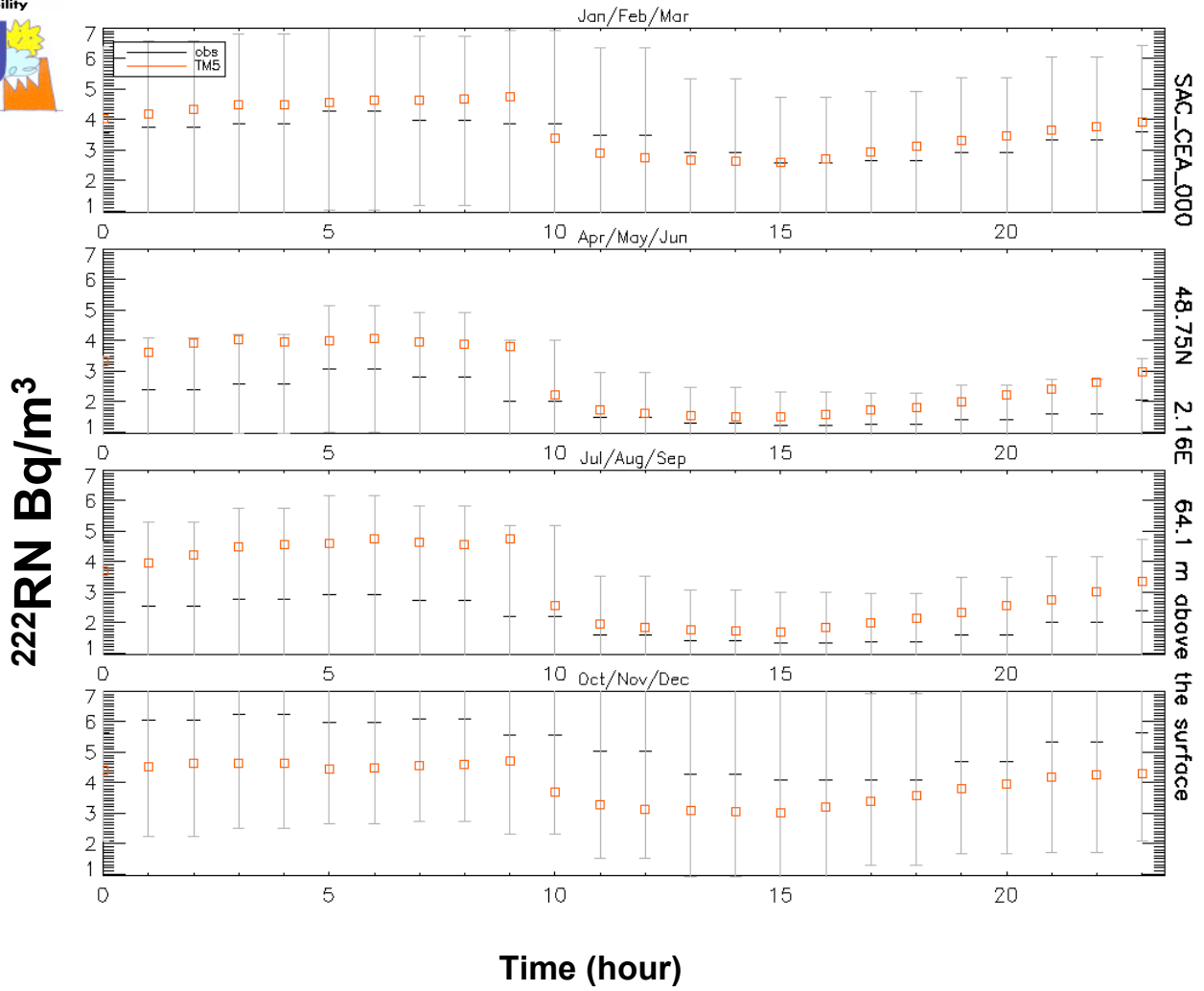
night 0-3 hh

Obs

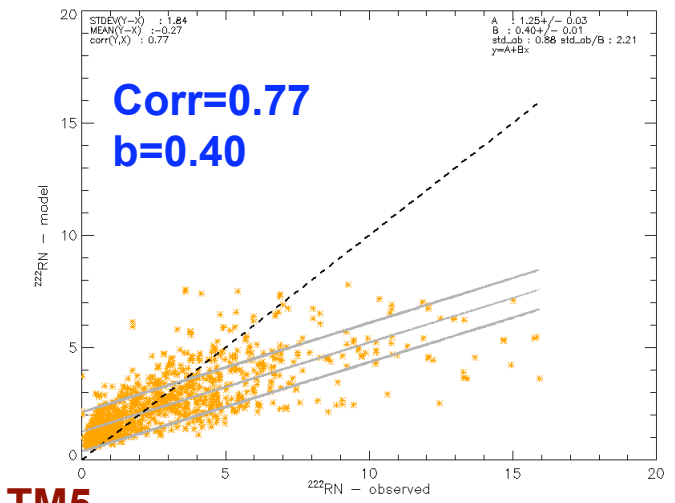


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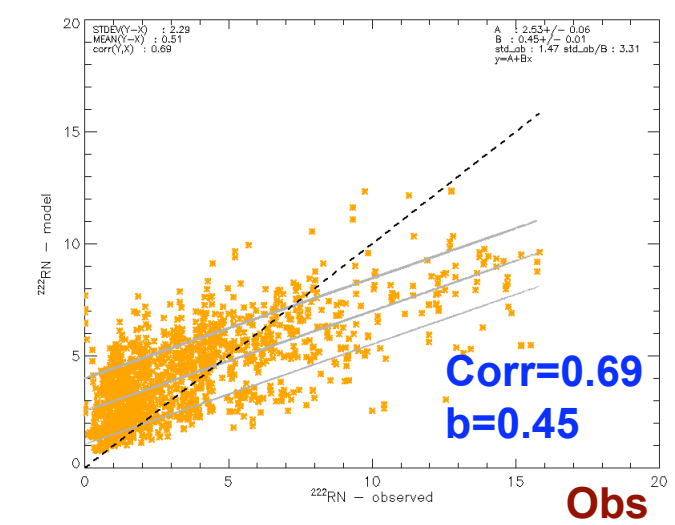
^{222}RN diurnal cycle



day 12-15 hh

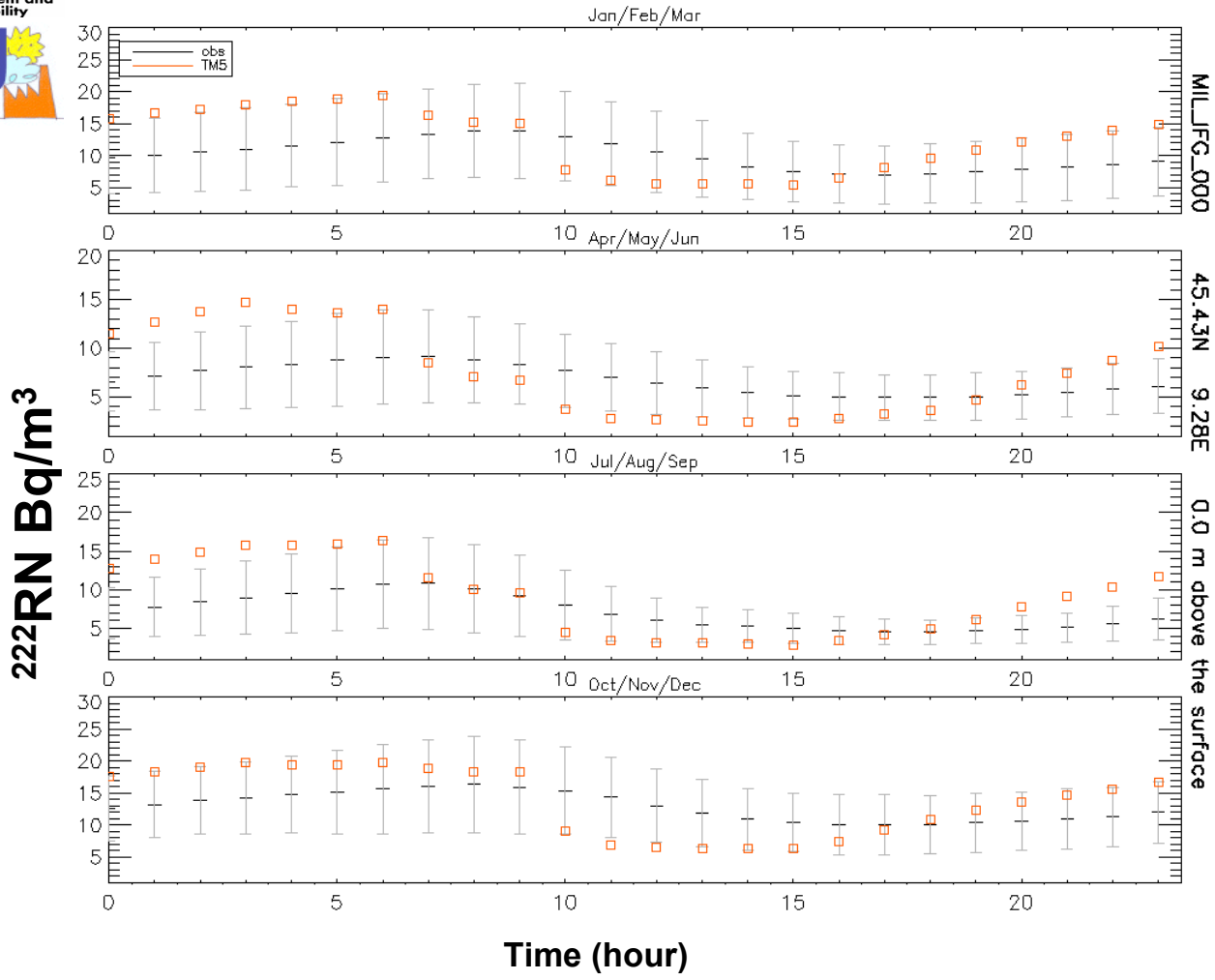


TM5

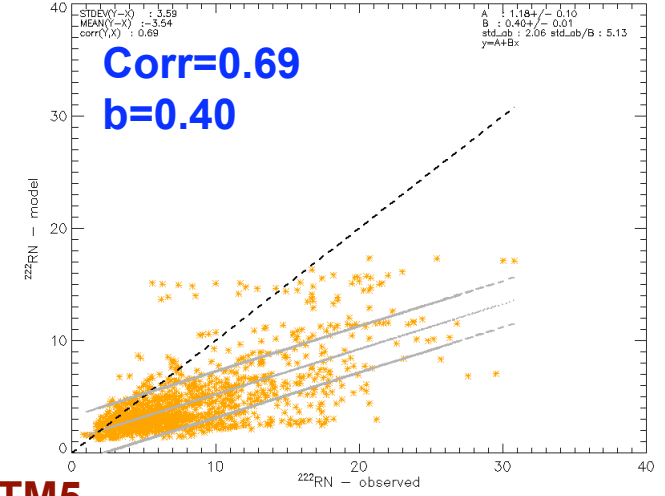


night 0-3 hh

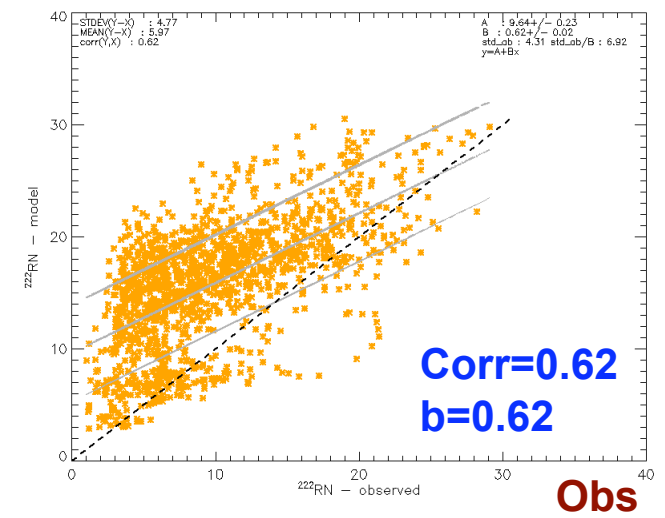
^{222}Rn diurnal cycle



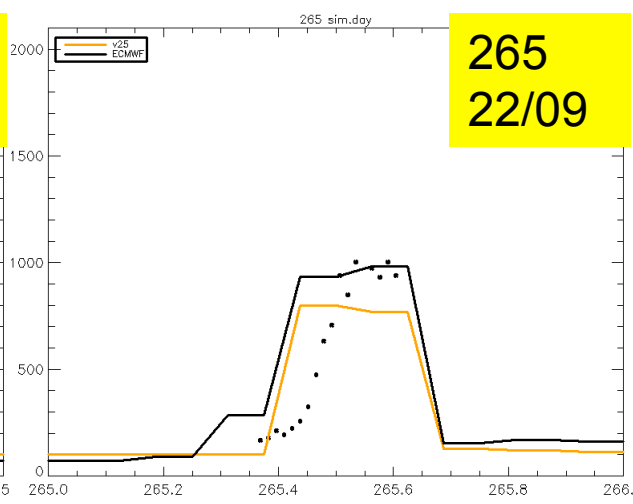
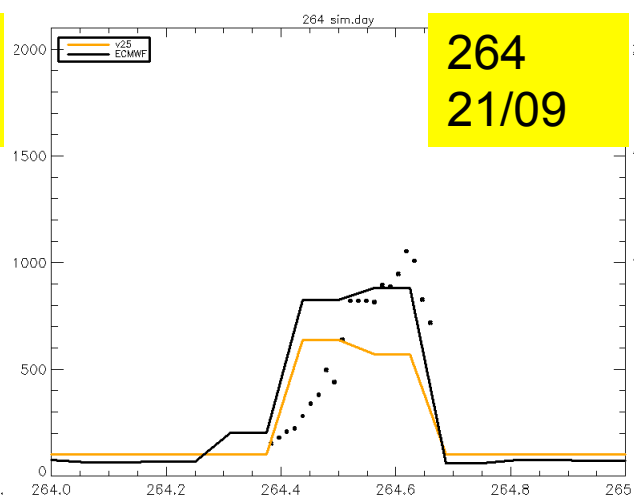
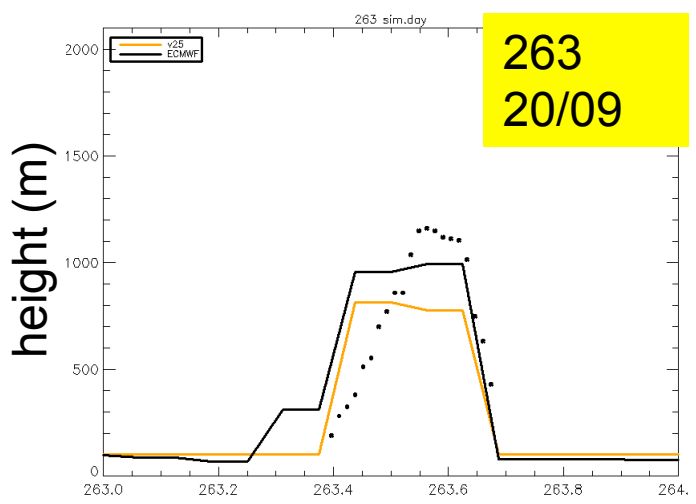
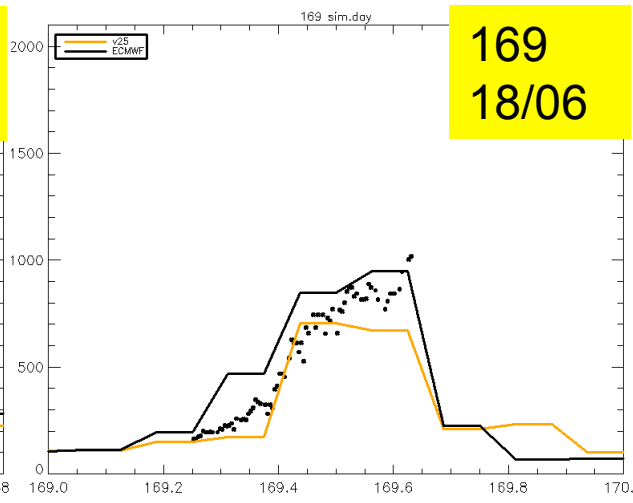
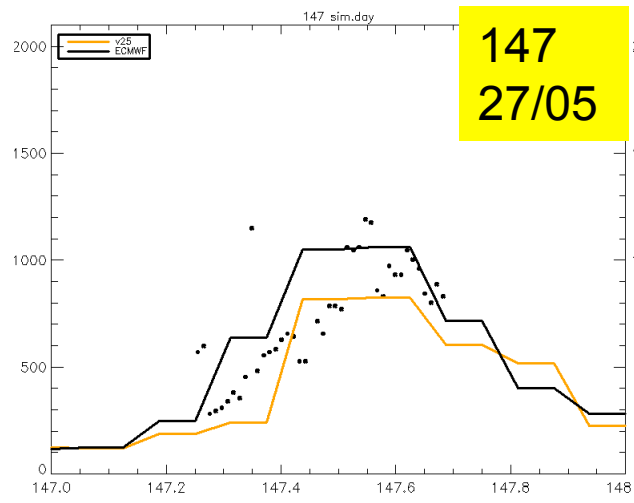
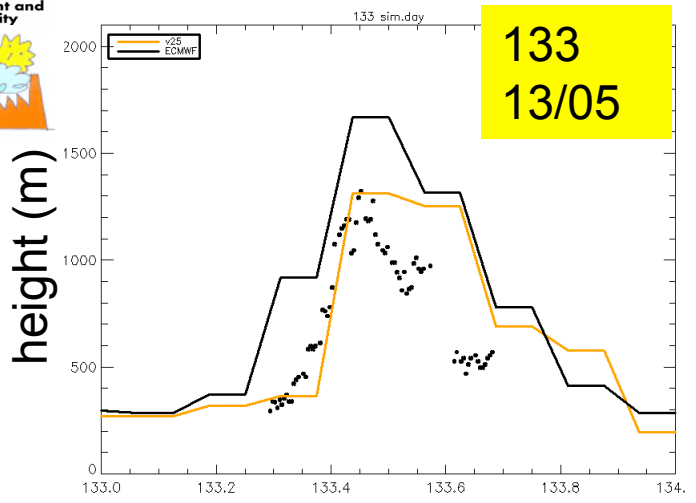
day 12-15 hh



TM5



night 0-3 hh



Year 2005 TM5 v25



TM5 radon simulations for the year 2005, TM5 v25

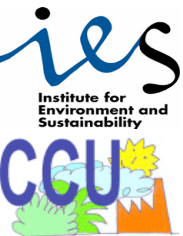
There are two new parameters:

czetak: controls k-diffusion coefficients
(e.g. $K' = K * czetak$)

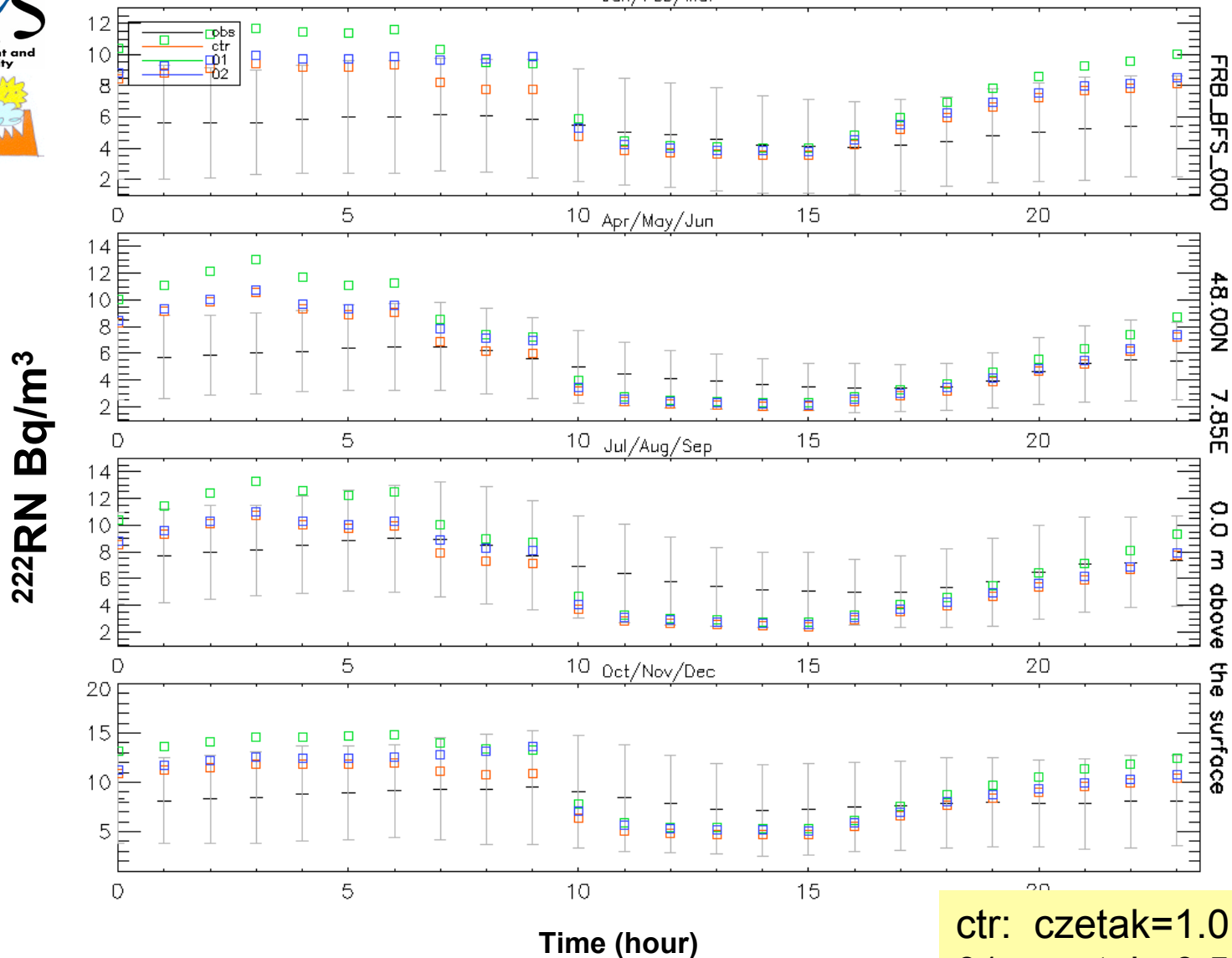
czeta_blh: controls PBL heights
(e.g. $BLH' = BLH * czeta_blh$)

Sensitivity tests:

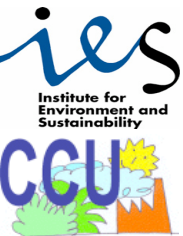
ctr:	czetak=1.0	czeta_blh=1.0
01 :	czetak=0.5	czeta_blh=1.0
02 :	czetak=1.0	czeta_blh=0.8



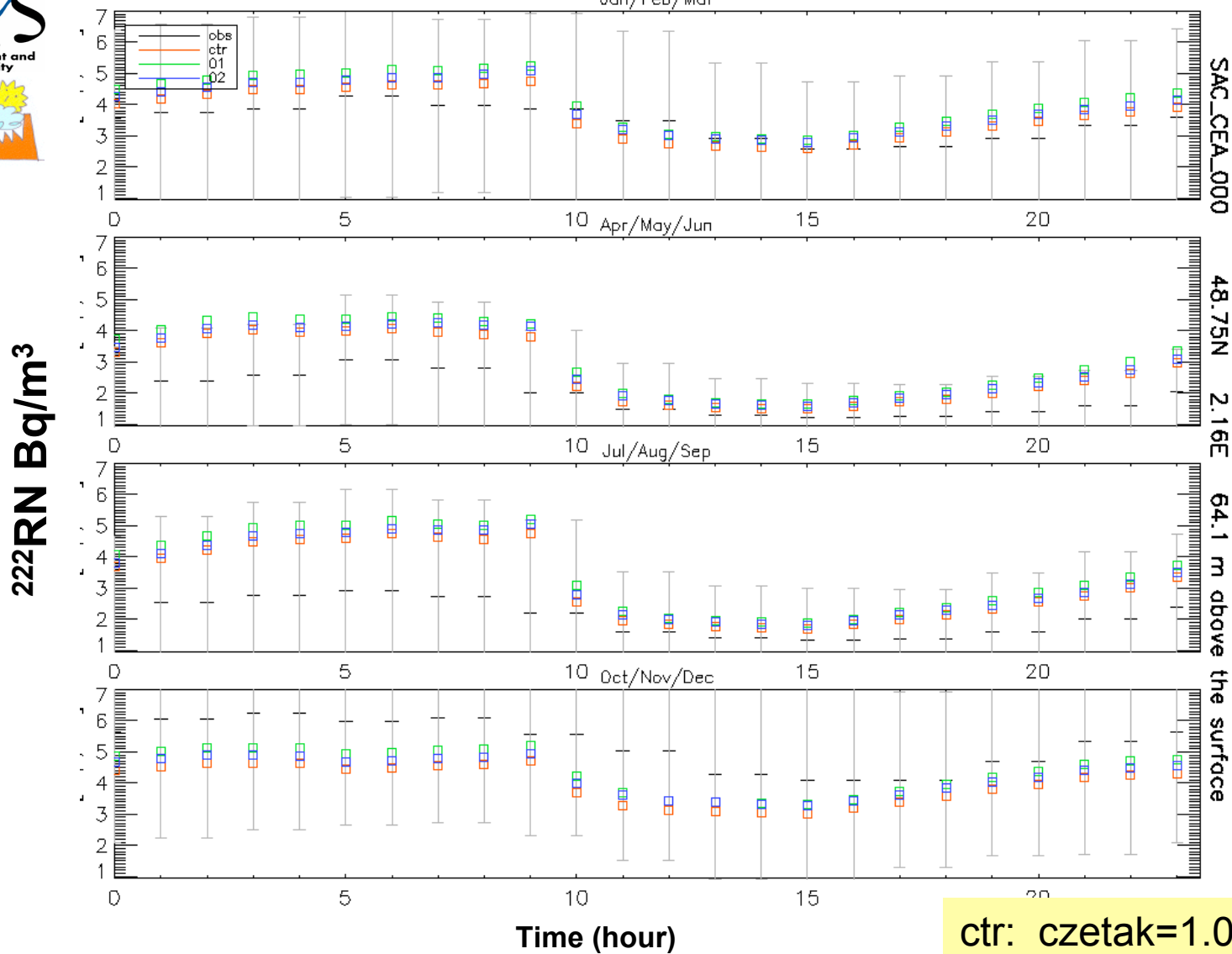
²²²Rn diurnal cycle



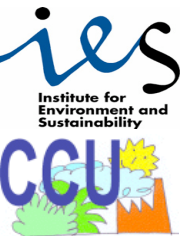
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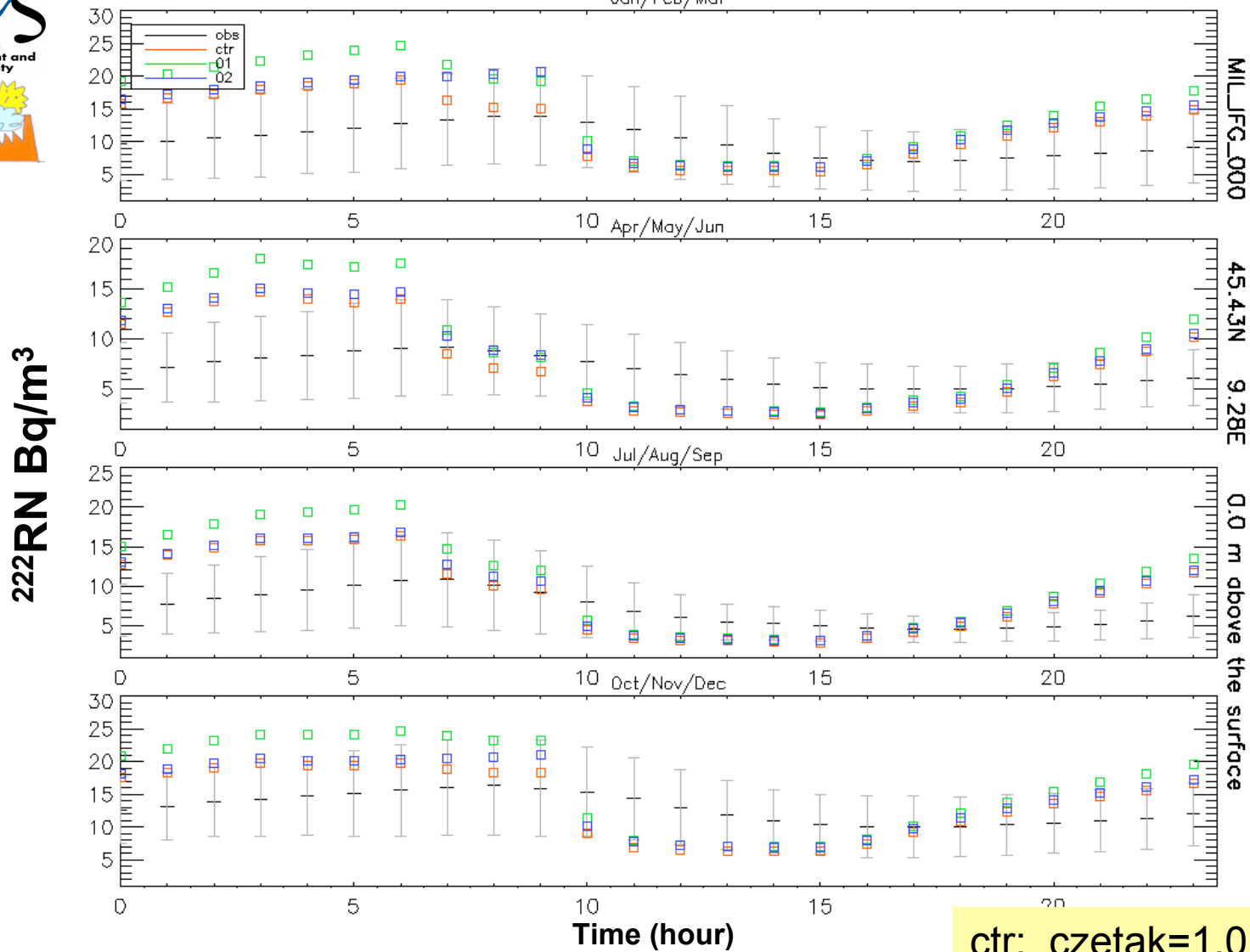
²²²Rn diurnal cycle



ctr: czetak=1.0 czeta_blh=1.0
 01 : czetak=0.5 czeta_blh=1.0
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²²²Rn diurnal cycle



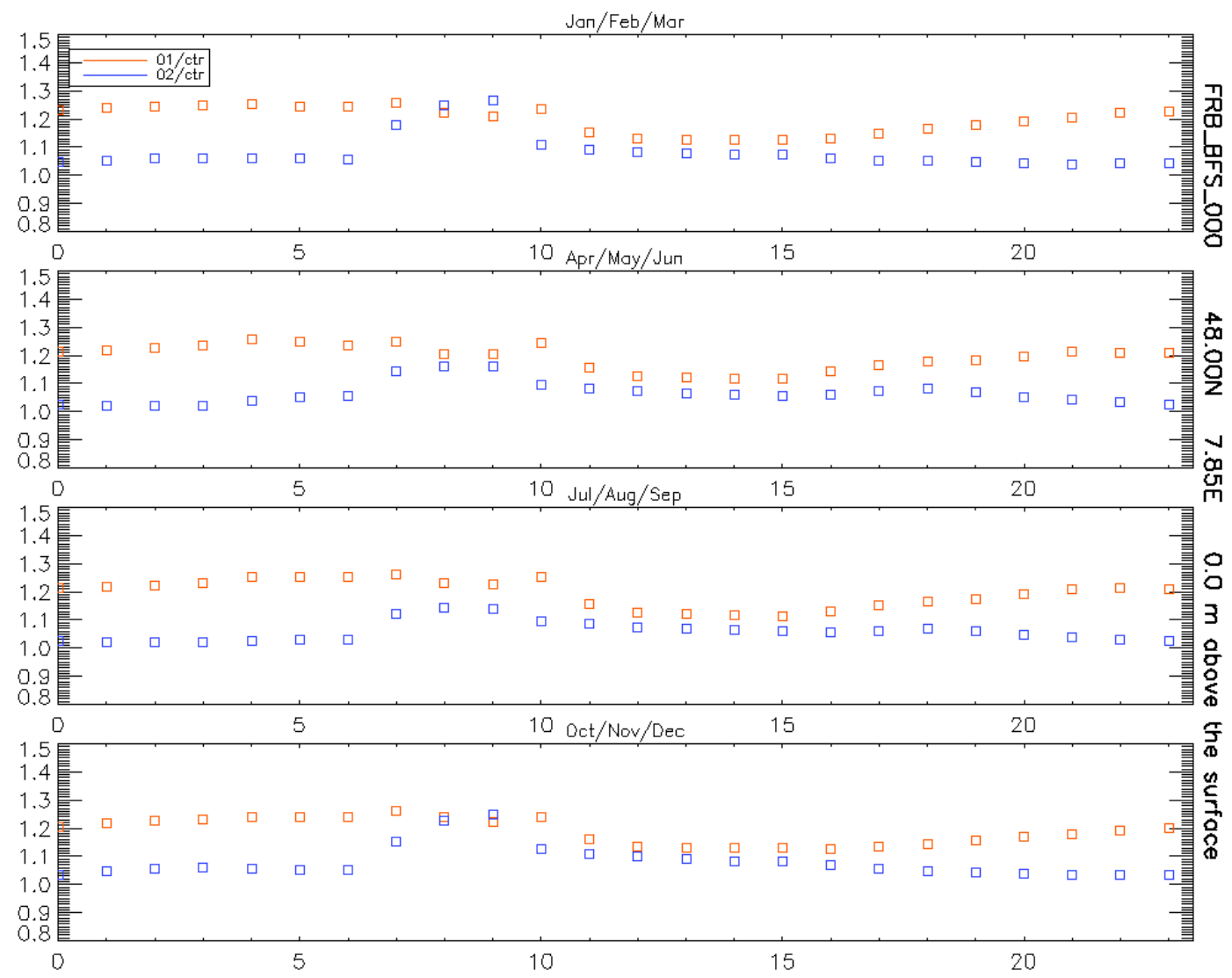
ctr: czetak=1.0 czeta_blh=1.0
 01 : czetak=0.5 czeta_blh=1.0
 02 : czetak=1.0 czeta_blh=0.8

Freiburg



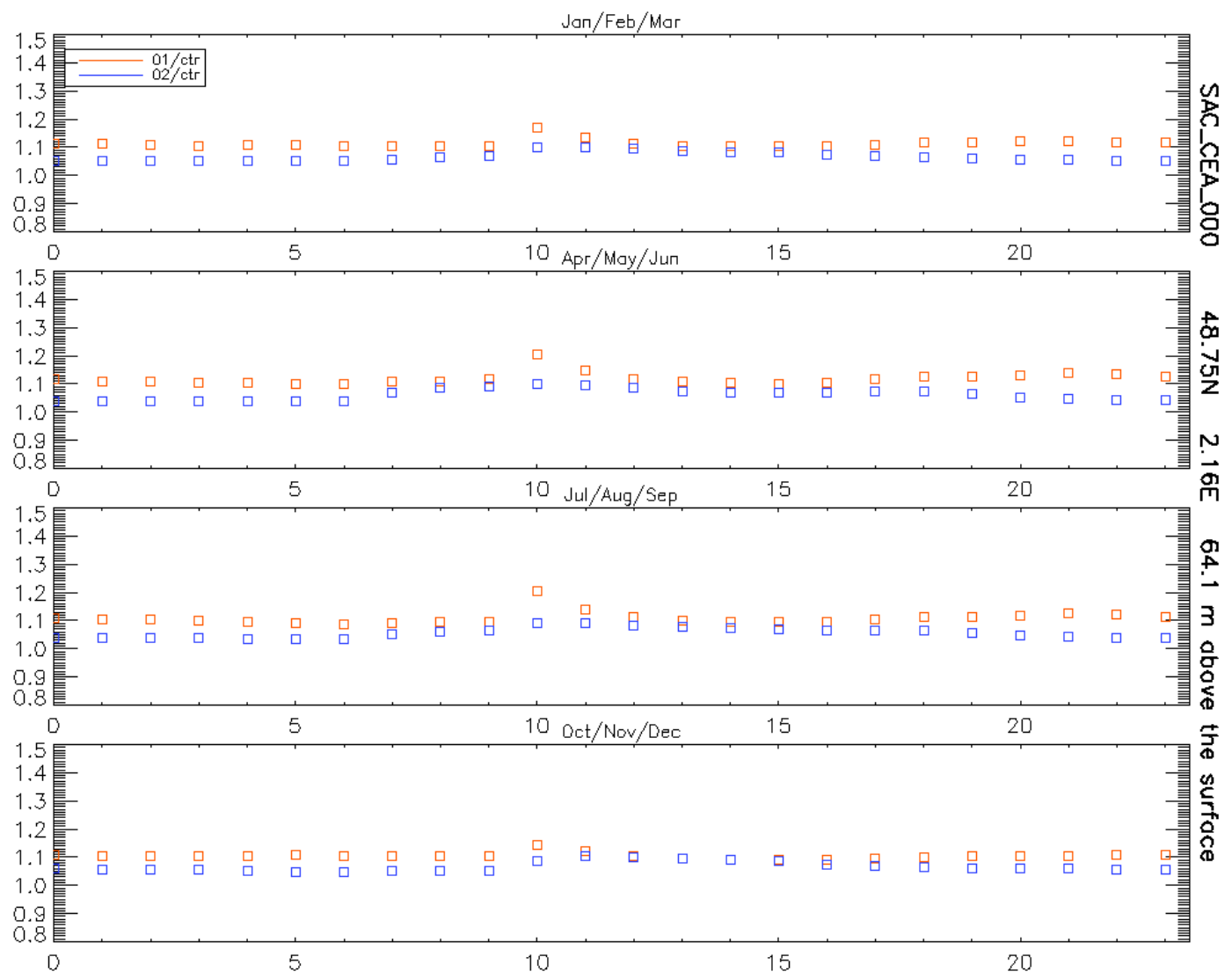
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Ratio ²²²Rn/²²²Rn





Ratio
 $^{222}\text{RN}/^{222}\text{RN}$





²²²RN Seasonal diurnal cycle from TM5

- > Generally underestimated values during daytime
- emissions not adequately represented
- sample locations too close to the surface
- calibration issues
- TM5 representation for diffusion and BL height

BLH studies:

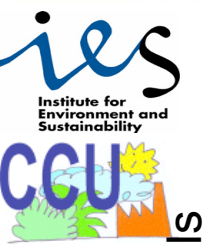
- BL from TM5 have uncertainties in agreement with results from the literature (Gerbig et al, 2007 ACP; Olivié et al, 2004)
- Biases are generally < 10%

Diffusion:

Sensitivity tests show significant differences in ²²²RN (up to 20%) during nighttime and much less variation during daytime (less than 10%)

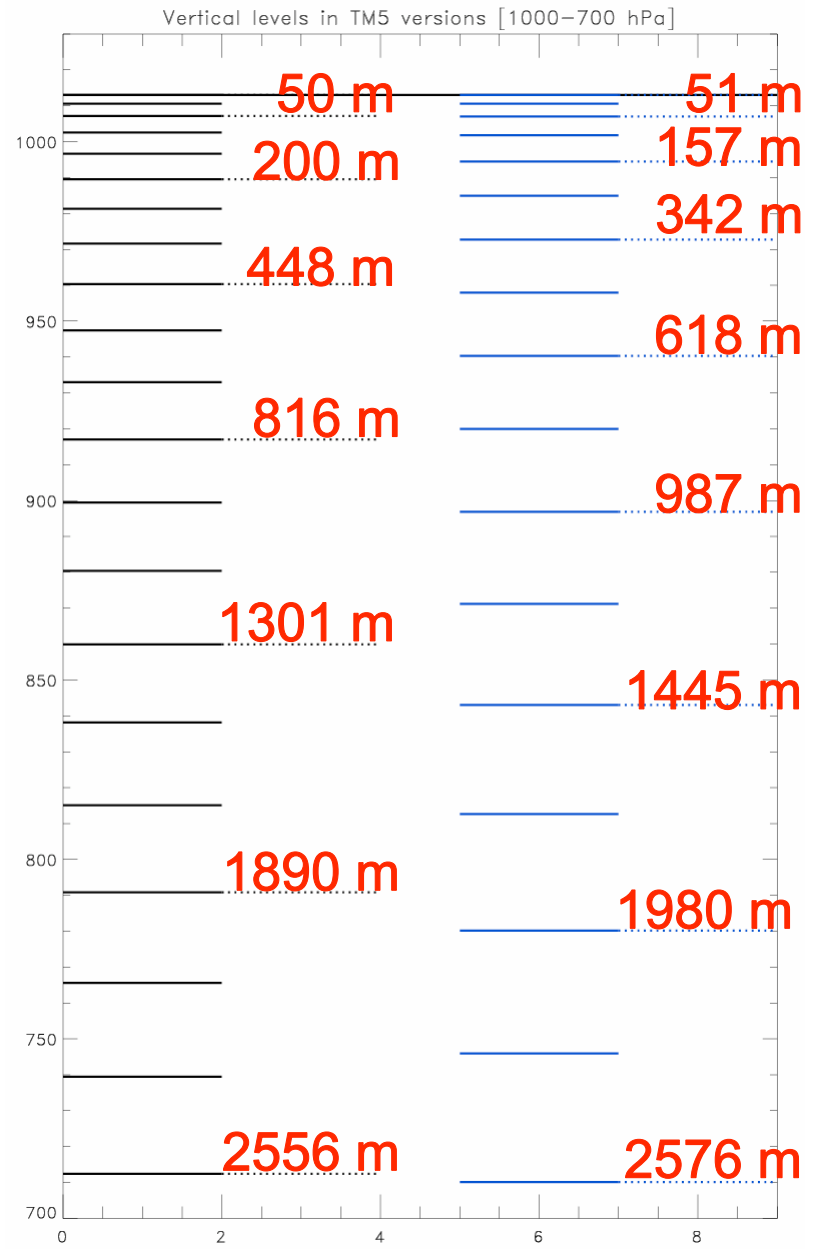
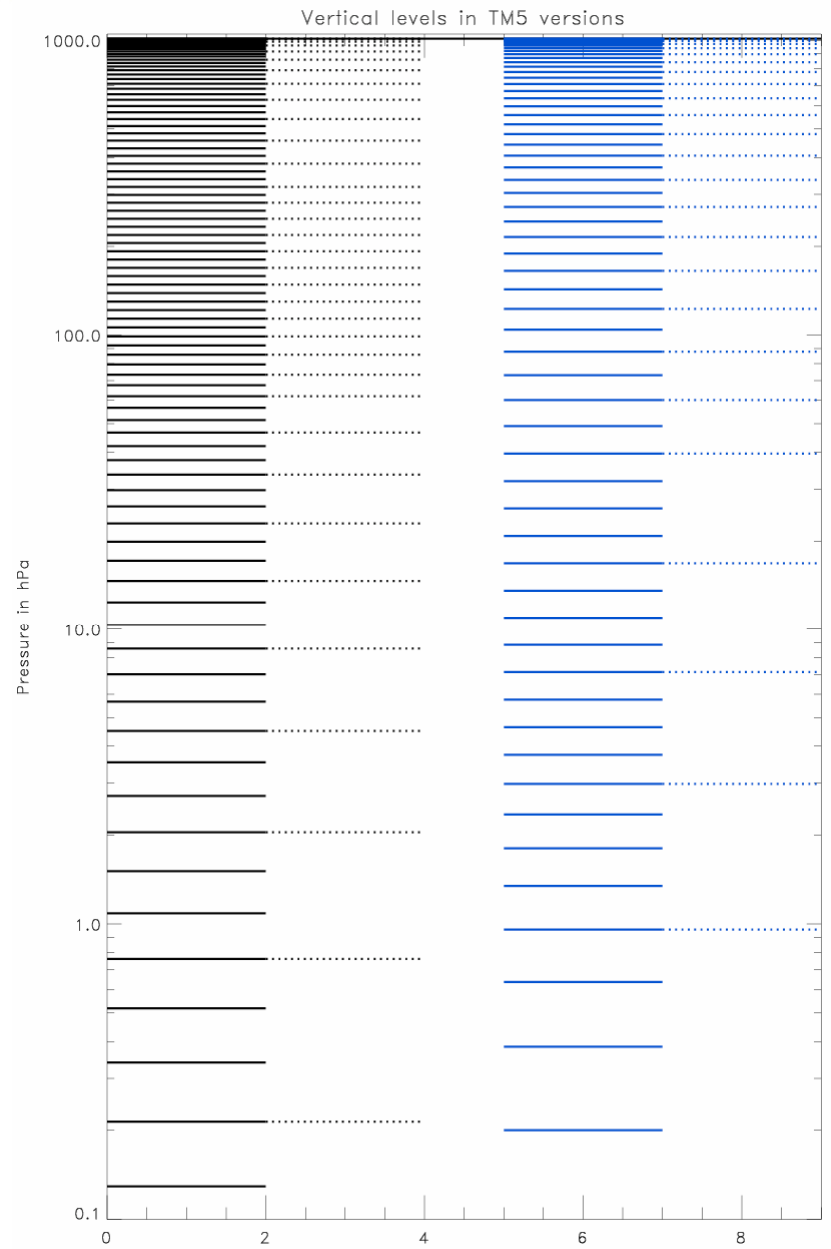
- > “agreement” with results from Olivié et al, 2004
- > indication to further look into Convection and diffusion processes

TM5: 25v(BLUE) versus 34v(BLACK) layers

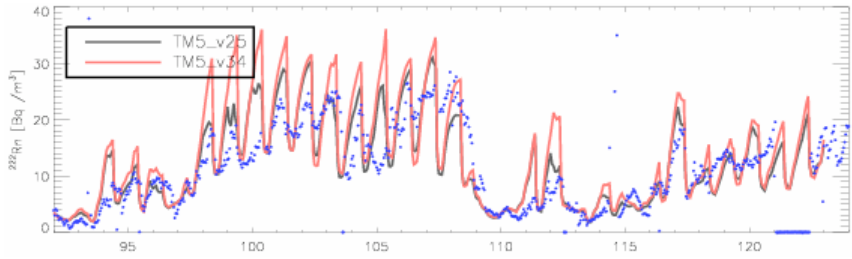


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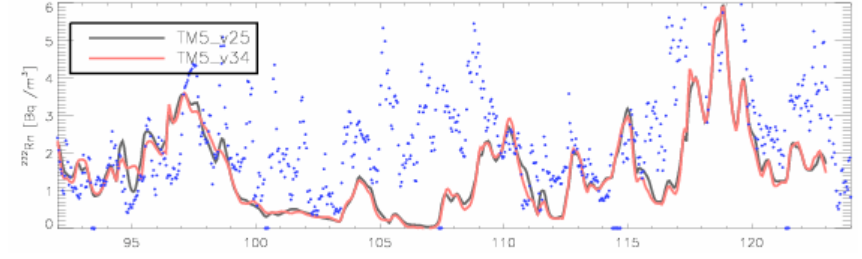
Solid line : grid heights for ECMWF levels
 Dotted line: grid heights for TM5 levels



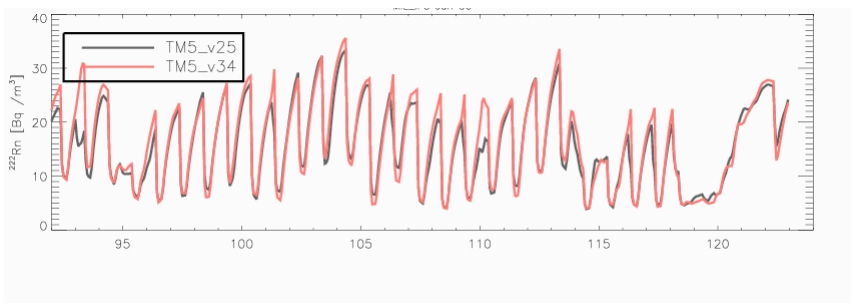
Freiburg (276m asl)
V25: 1st level
V34: 1st level



Schauinsland (1205m asl)
V25: 5th level
V34: 4th level



Milan (103m asl)
V25: 1st level
V34: 1st level



Puy de Dome (1465m asl)
V25: 5th level
V34: 5th level

