A new method to correct radiosonde temperature biases using radio occultation data

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EUMETSAT Radio Occultation Meteorology Satellite Application Facility

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Motivation

- RS[1] and RO[2] profiles are assimilated into the numerical weather forecast
  $\rightarrow$ anchor the temperature in the model

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- Impact of high quality observations might be limited due to biases between observation types
- Better exploitation of RO and RS possibly given a bias correction of RS before the assimilation

[1] Radiosonde
[2] Radio Occultation

Radio Occultation

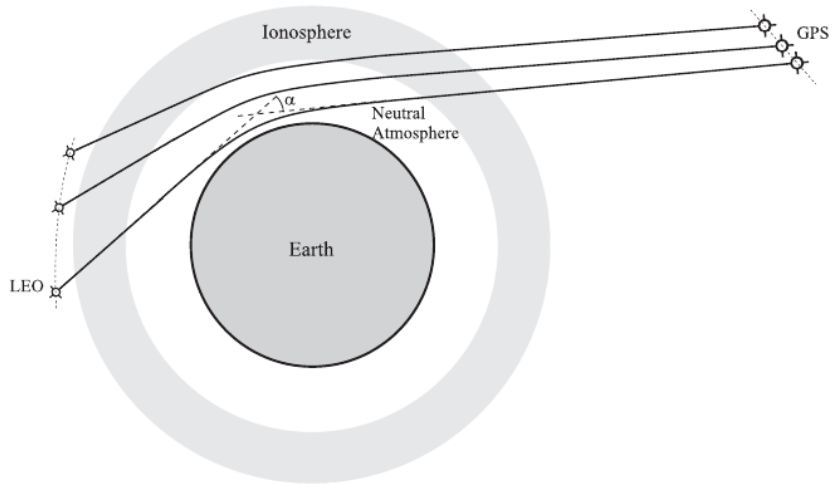
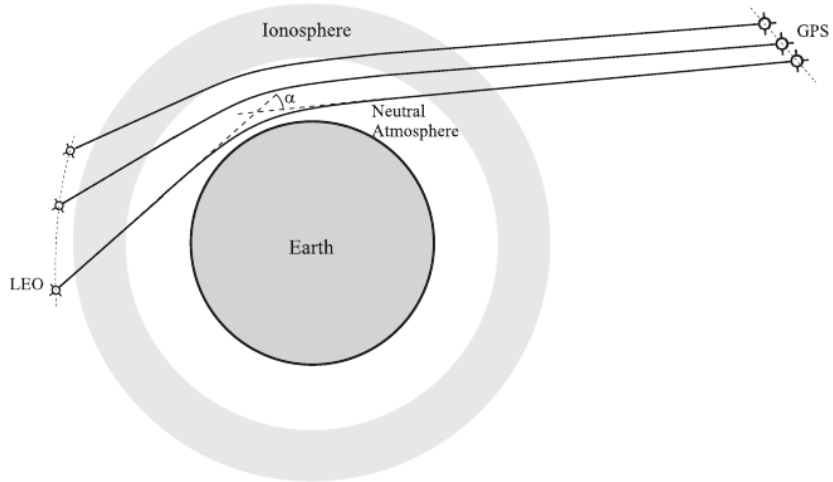


Figure credit: Stig Syndergaard, 1999
LEO: Low Earth Orbit, GPS: Global Positioning System
α bending angle

Radio Occultation



Phase shift $\rightarrow$ bending angle $\rightarrow$ refractivity $\rightarrow$ (dry) temperature

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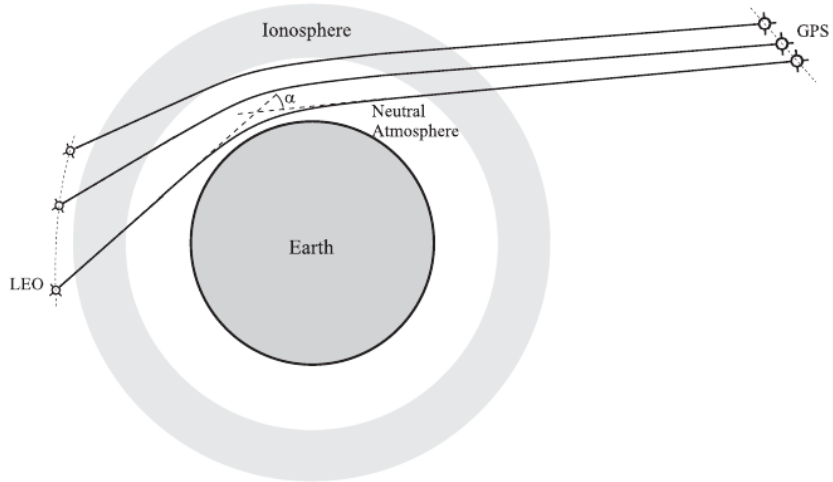

Phase shift $\rightarrow$ bending angle $\rightarrow$ refractivity $\rightarrow$ (dry) temperature $\rightarrow$ SI traceability

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- Intention: Providing an station-by-station RS temperature bias correction on standard pressure levels
  $\rightarrow$ subdivided in four SEA[3] ranges

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- Assumption: B_{RO} and B_{RS} are equally representative of true values at RO/RS locations

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RS

- Mean RS temperature departure calculated for each SEA range at each site

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- Minimize the impact of a priori knowledge

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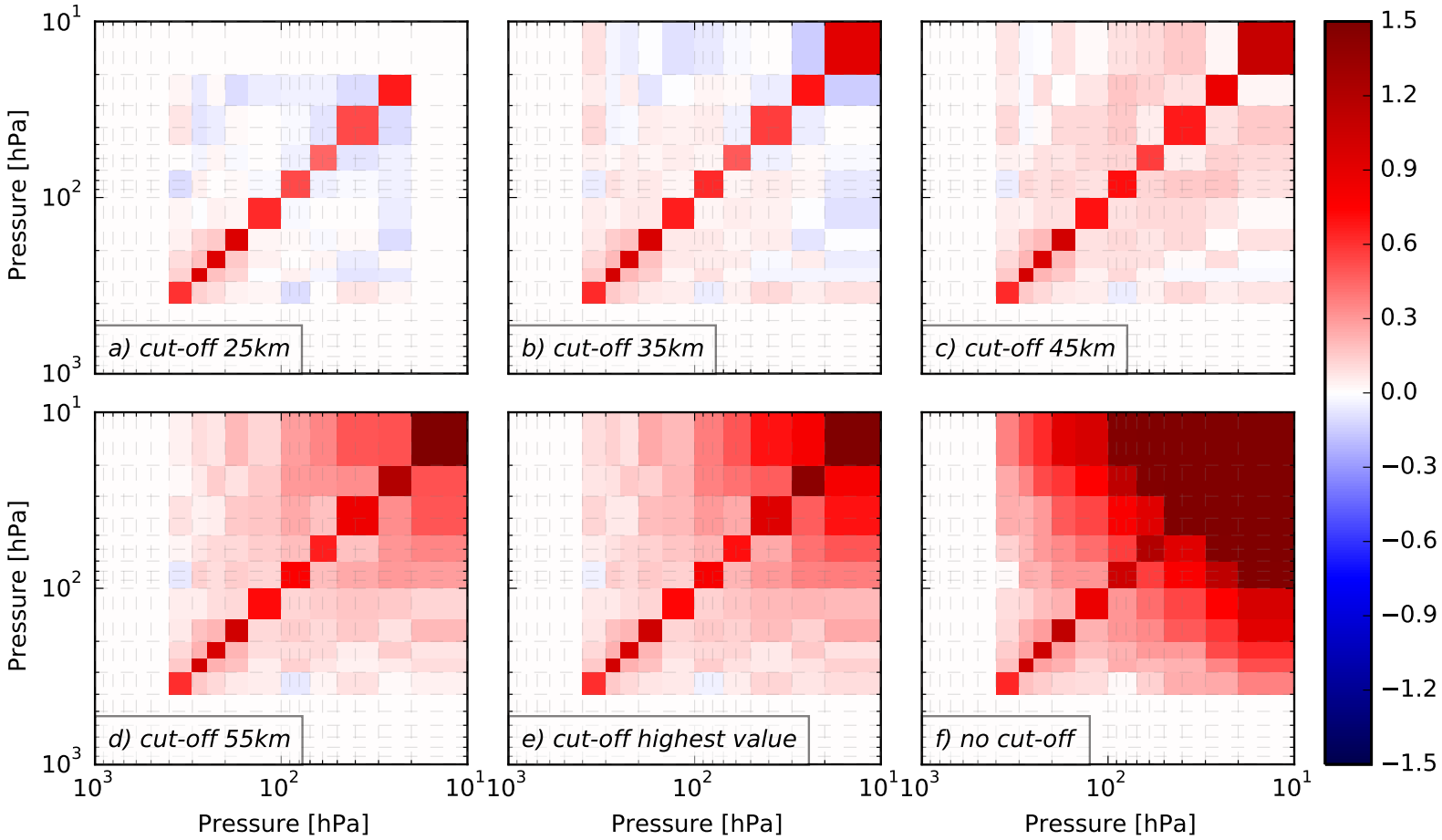
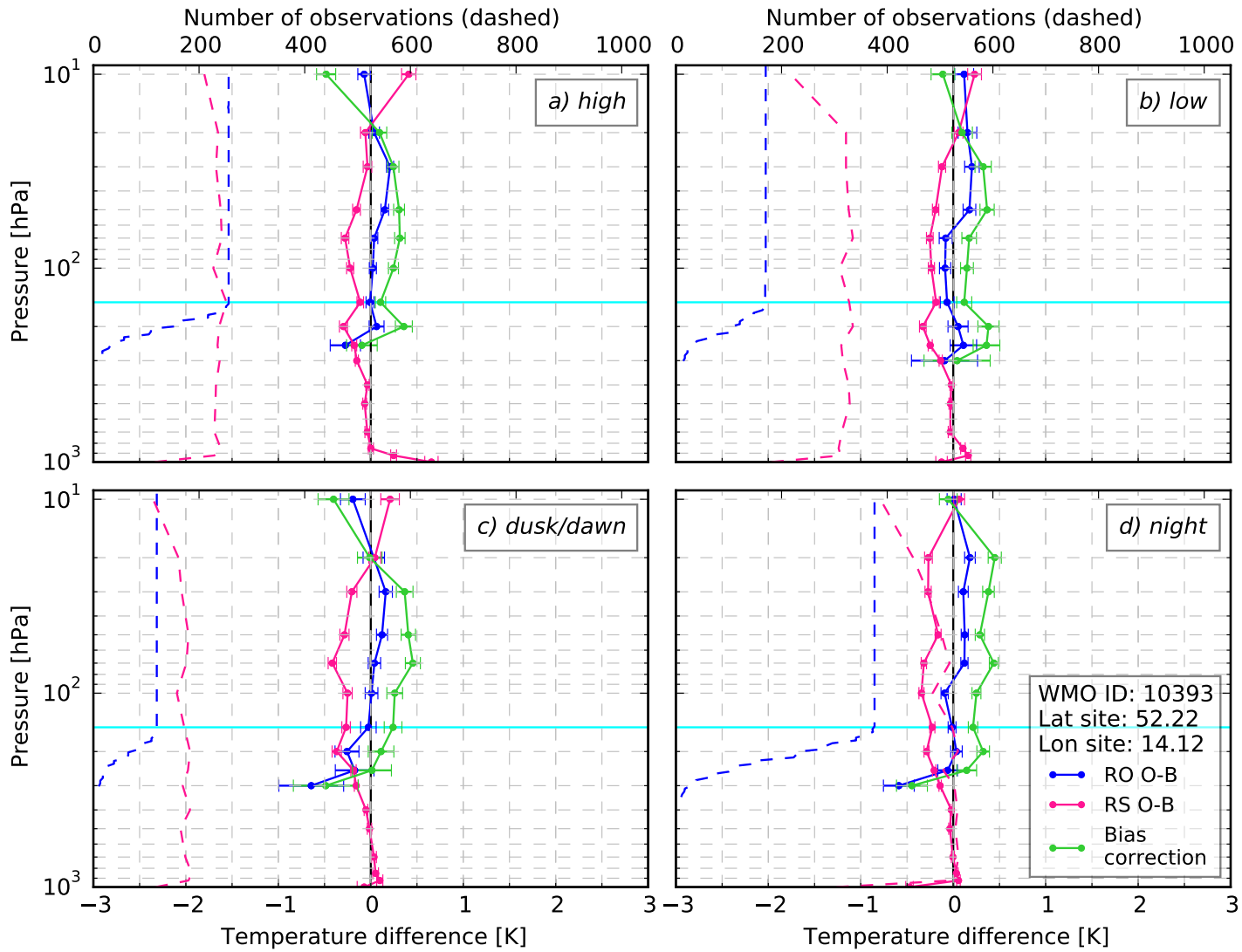
Advantages of the method: Covariance matrix



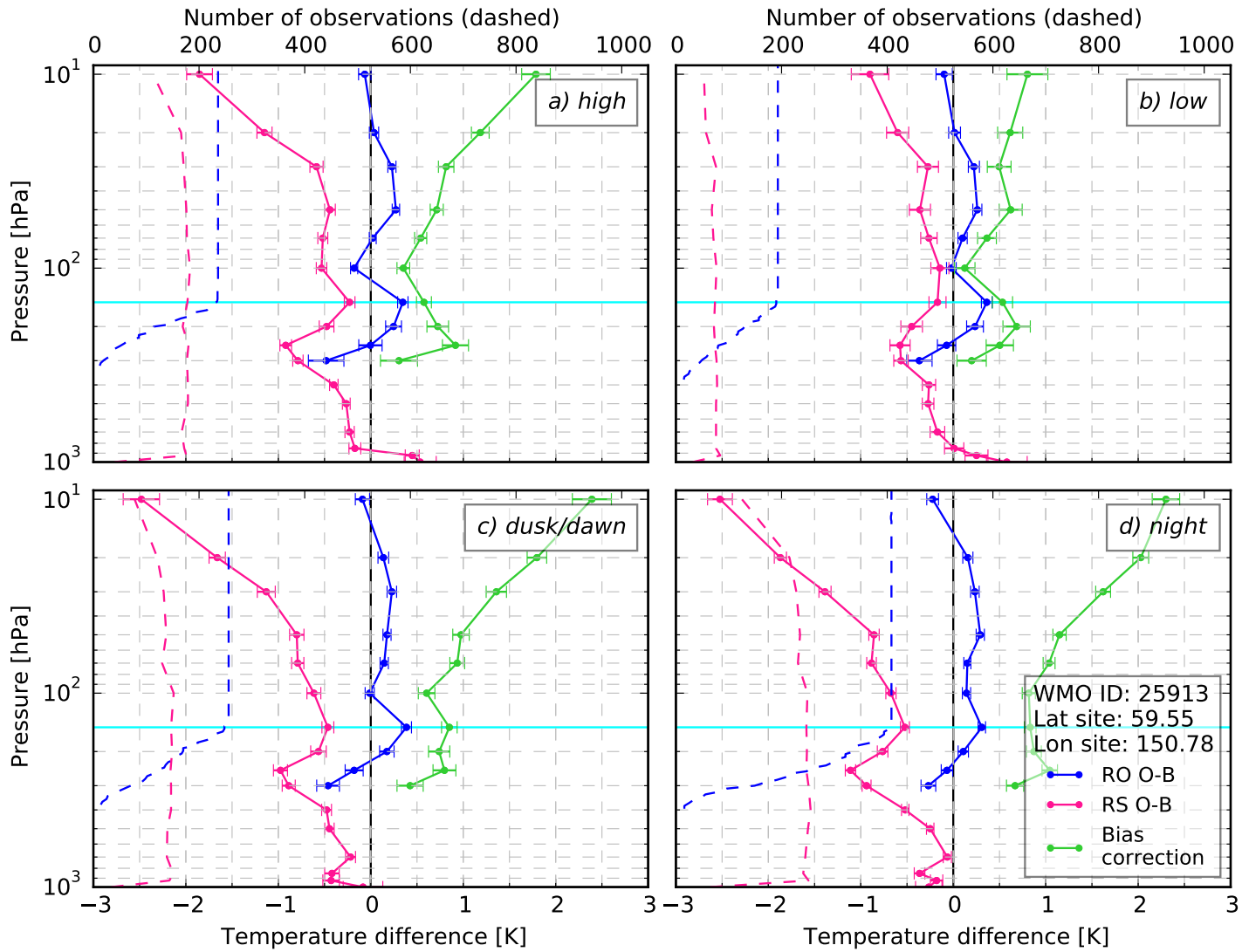
Example upper-air sites

Country	Lat	Lon	WMO ID	RS type
Germany	52.22	14.12	10393	RS92
Russia	59.55	150.78	25913	Various Russian sondes
Antarctica	-69.0	39.58	89532	Meisei

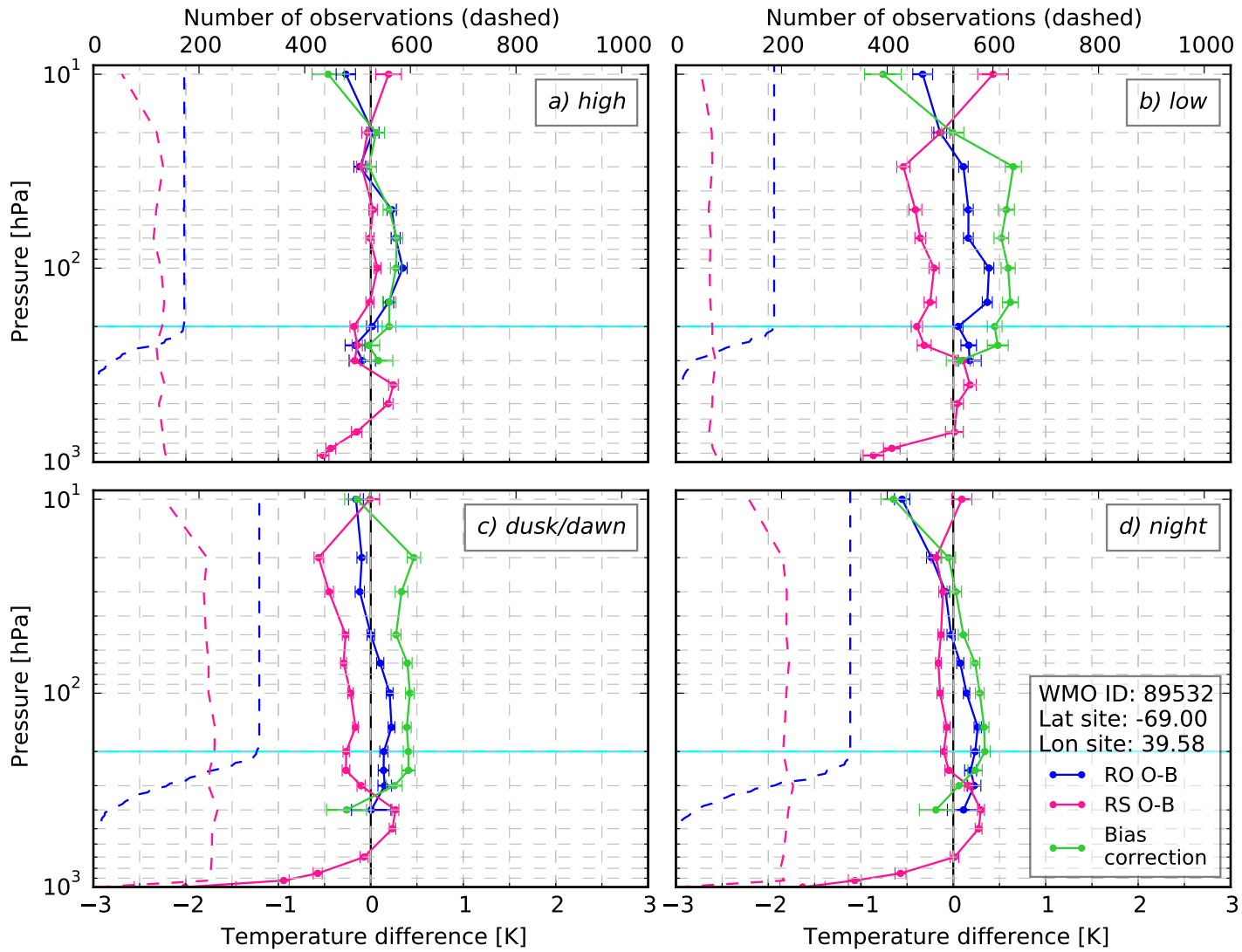
Lindenberg RS bias in Met Office assimilation



Russian RS bias in Met Office assimilation



Antarctic RS bias in Met Office assimilation



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- A forecast impact study is planned
- Analysis of GRUAN data is planned in next ROM SAF Visiting Scientist project

Thank you for your attention!