Status update of GRUAN data products for Meisei RS-11G and iMS-100 radiosondes

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ICM-11

Current status for RS-11G-GDP

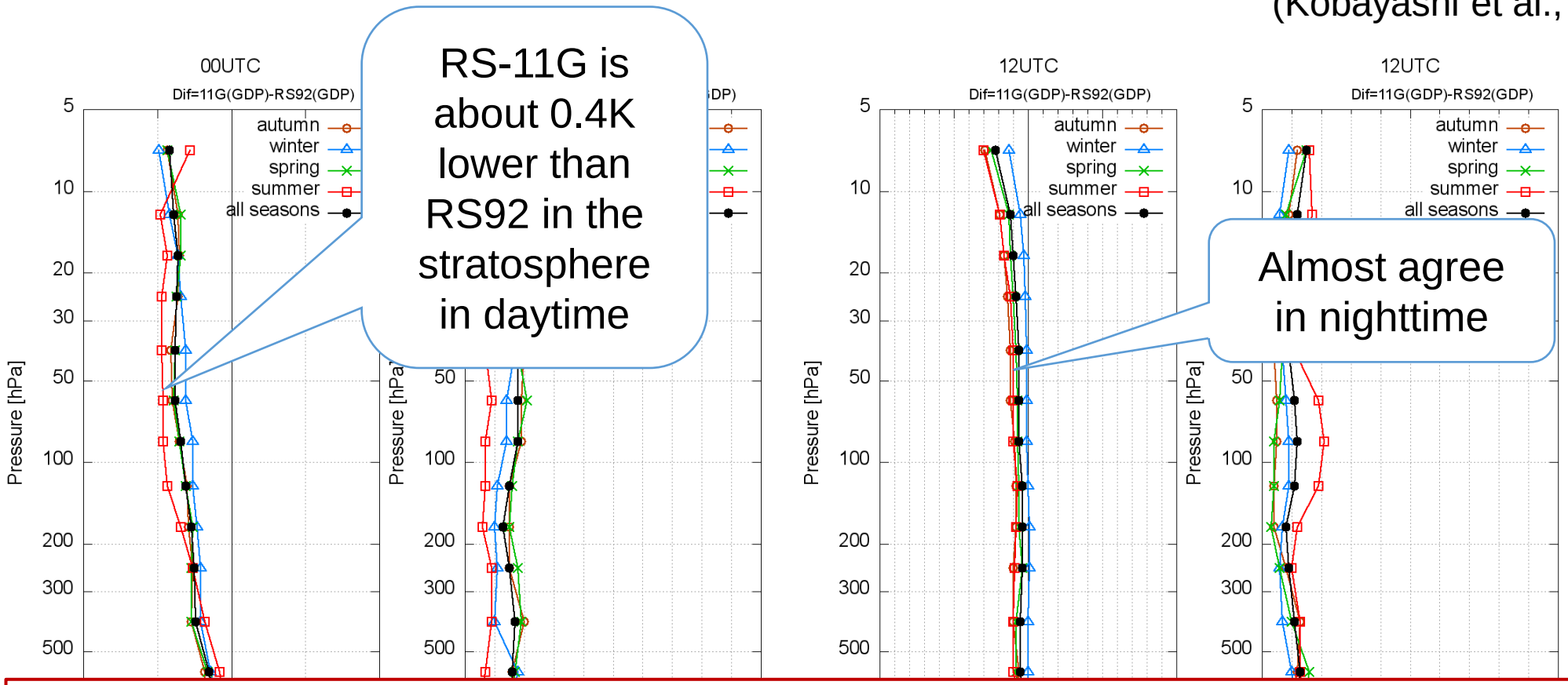
- The peer-reviewed paper about the comparison between RS-11G-GDP and RS92-GDP has been accepted:
  - Kobayashi, E., S. Hoshino, M. Iwabuchi, T. Sugidachi, K. Shimizu, and M. Fujiwara, 2019: Comparison of the GRUAN data products for Meisei RS-11G and Vaisala RS92-SGP radiosondes at Tateno (36.06°N, 140.13°E), Japan. Atmos. Meas. Tech. Discuss., 2019, 1–34, doi:10.5194/amt-2018-416.
- RS-11G-GDP (ver. 1) for TAT (Jul. 2013 to Feb. 2018) and SYO (Mar. 2018 to present) has been processed by TAT
- The update of processing algorithm is planned

Current status for IMS-100-GDP

- The peer-reviewed paper is in preparation
  - The comparison between IMS-100-GDP and RS92-GDP or other reference sensors is under studying
- IMS-100-GDP (Beta) for TAT (Sep. 2017 to present) and MTS (Jan. 2018 to present) has been processed by TAT
- The update of processing algorithm is planned

RS-11G vs RS92 (Temperature)

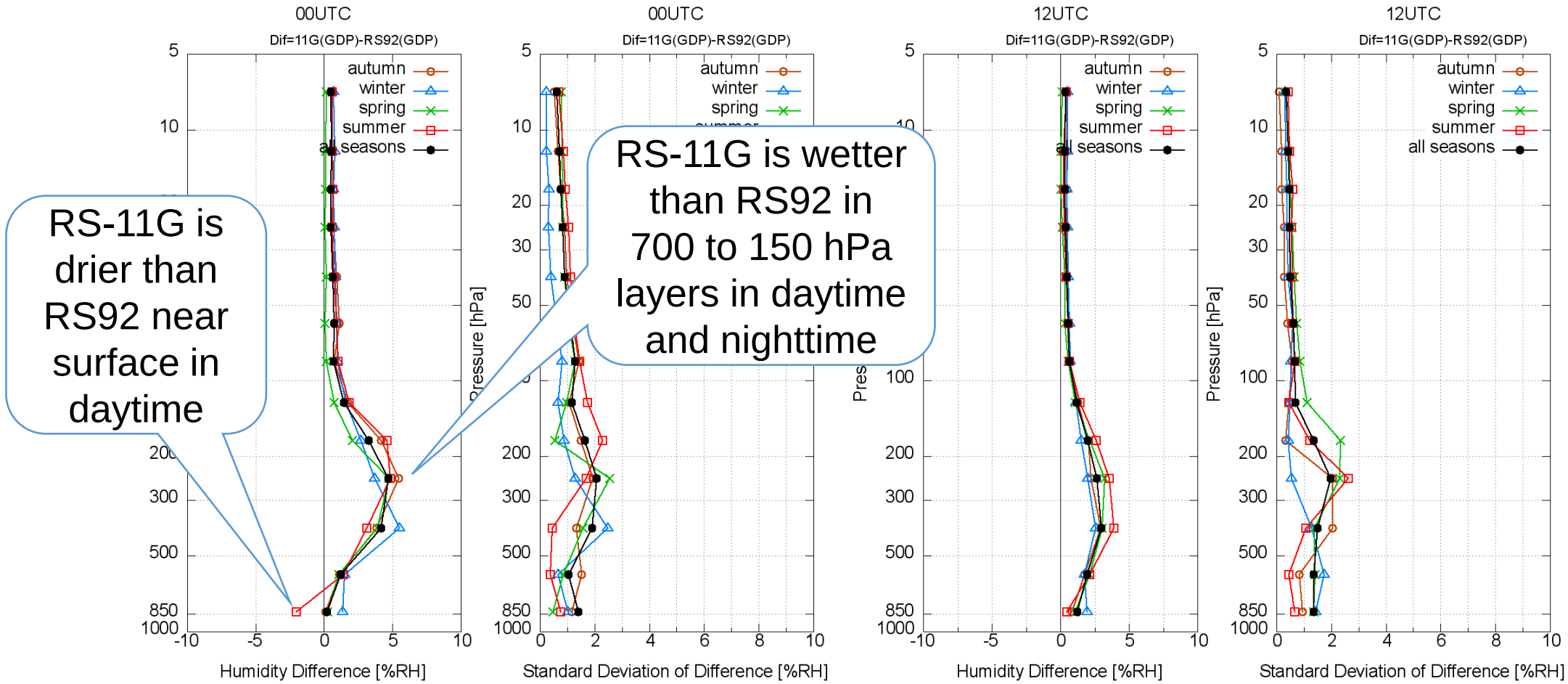
(Kobayashi et al., 2019)



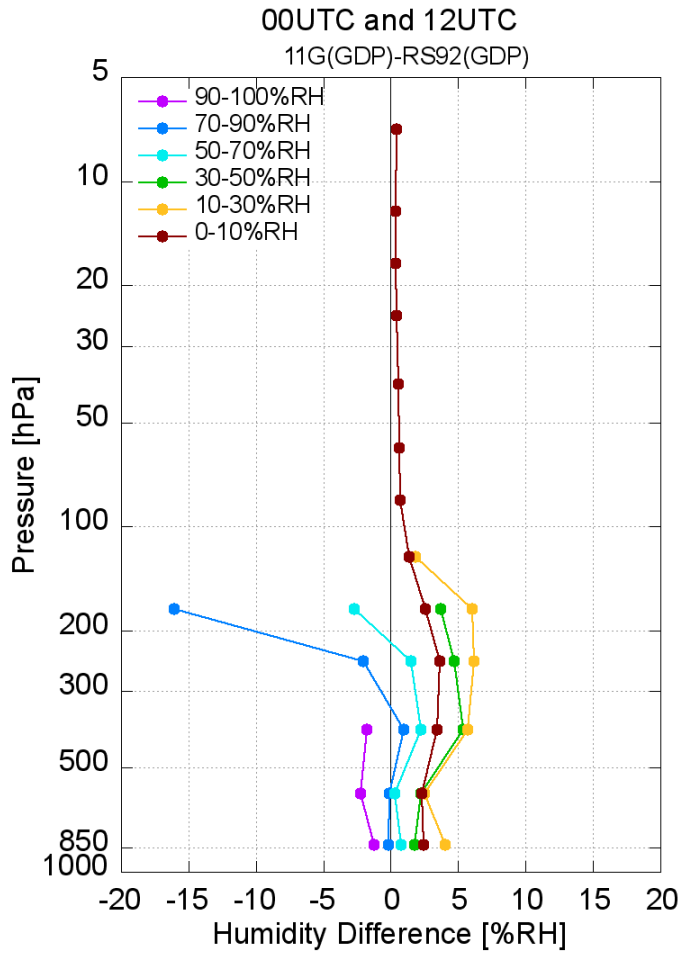
The difference in daytime seems to be caused by estimation of heating by solar radiation, so it is needed to be improved

RS-11G vs RS92 (Humidity)

(Kobayashi et al., 2019)



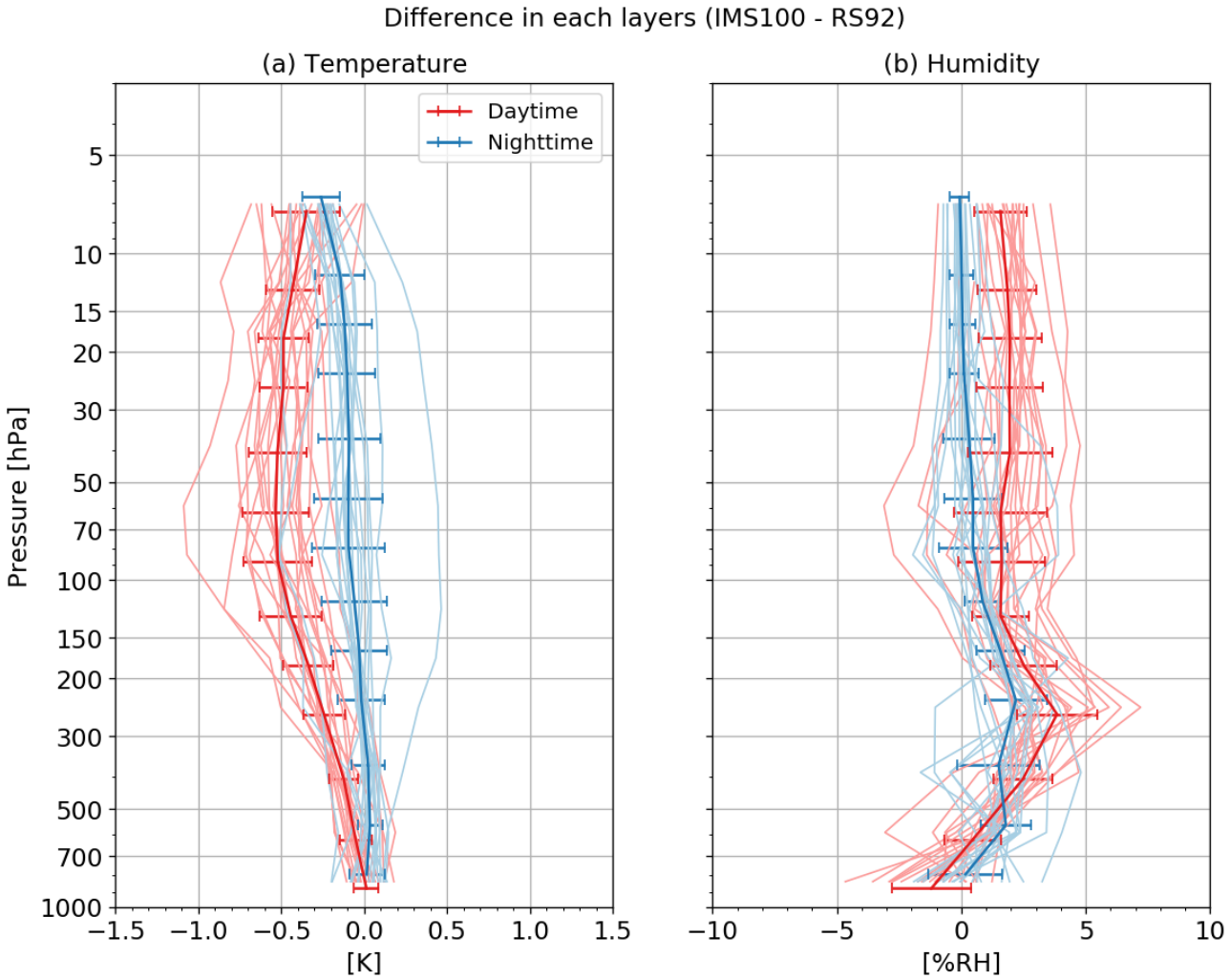
RS-11G vs RS92 (Humidity)



- RS-11G is 2 %RH drier than RS92 under >= 90%RH conditions
- RS-11G is 5%RH wetter than RS92 under < 50%RH conditions

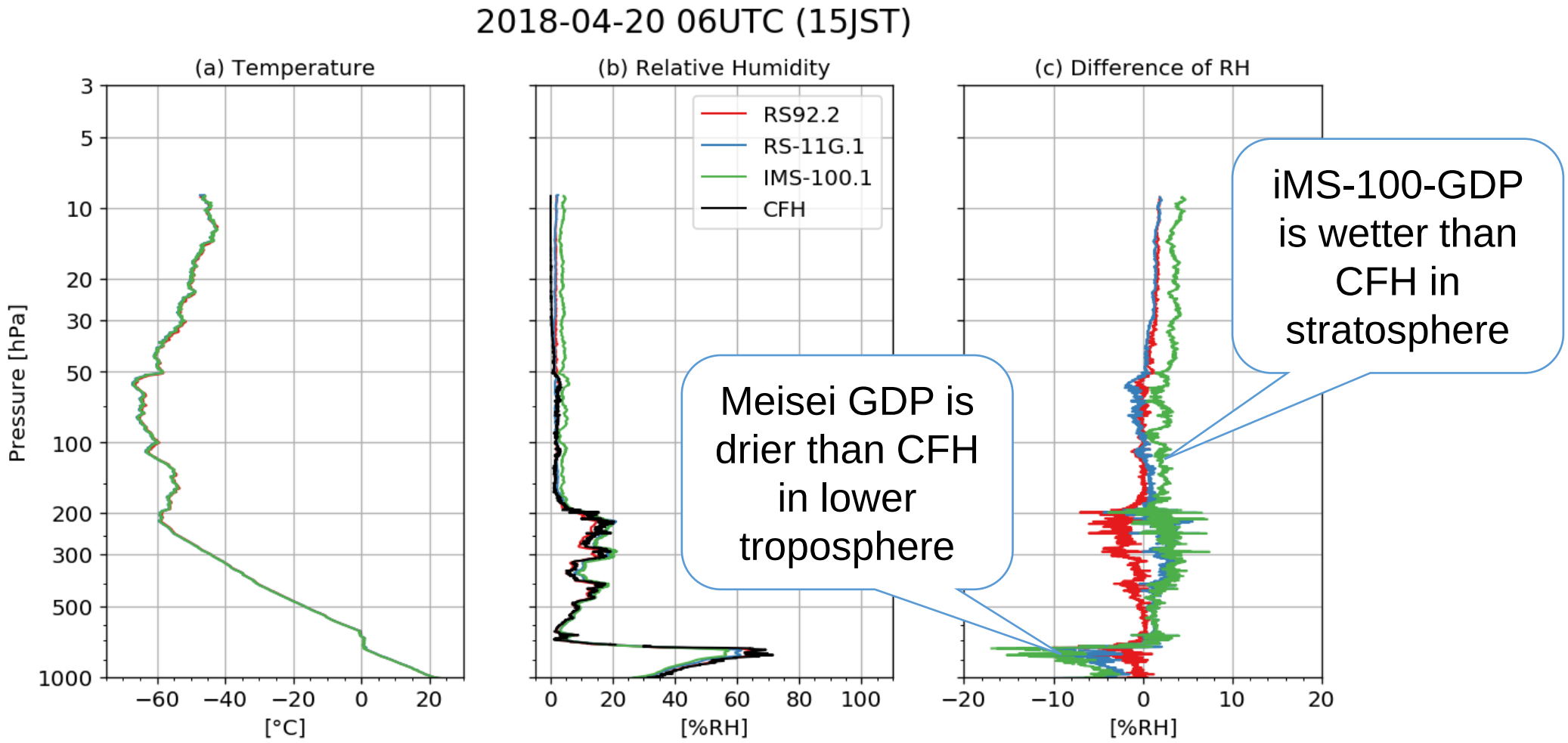
(Kobayashi et al., 2019)

iMS-100 vs RS92

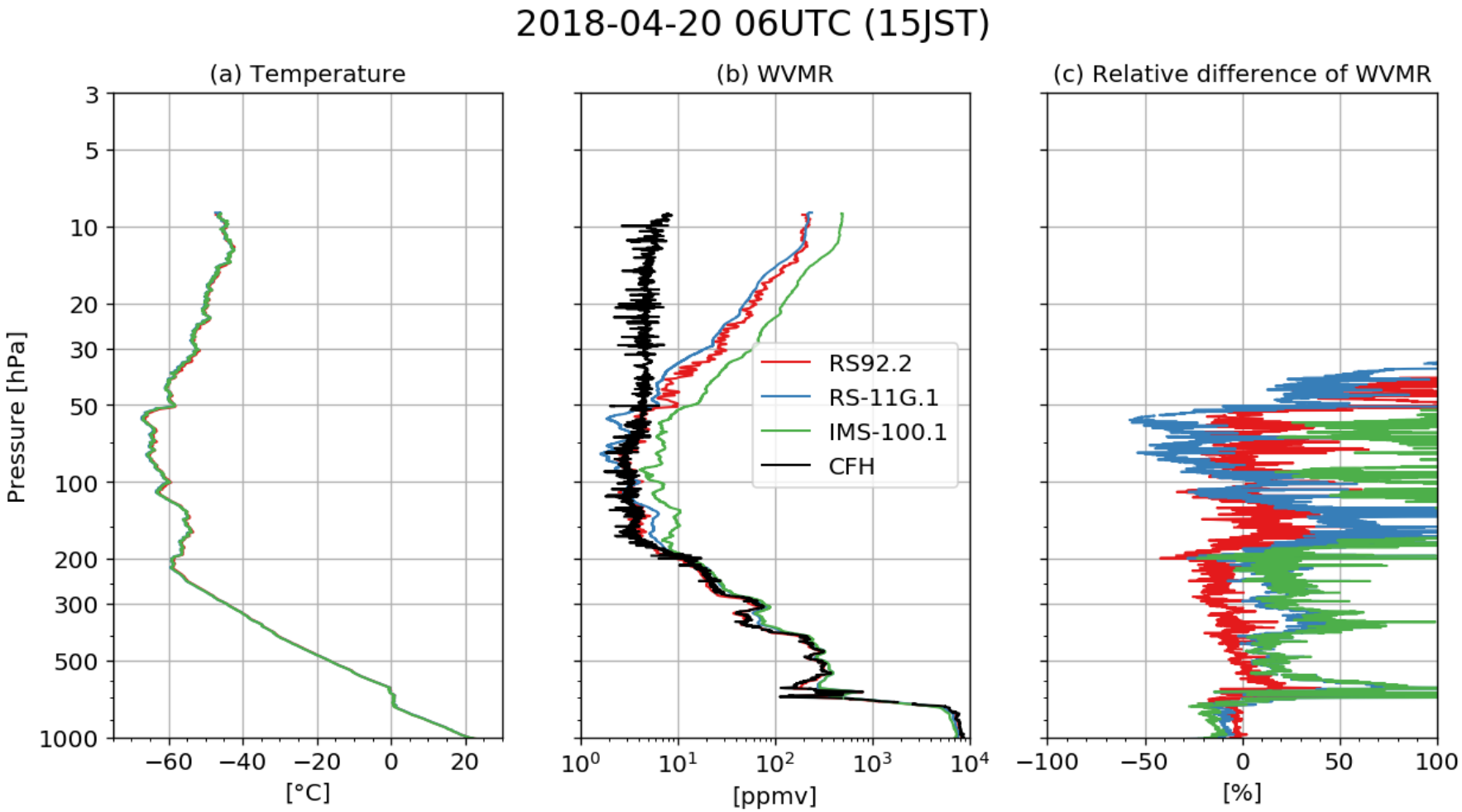


- Since Sep. 2017 – Apr. 2019
- 20 daytime cases and 17 nighttime cases
- Almost the same characteristics as RS-11G

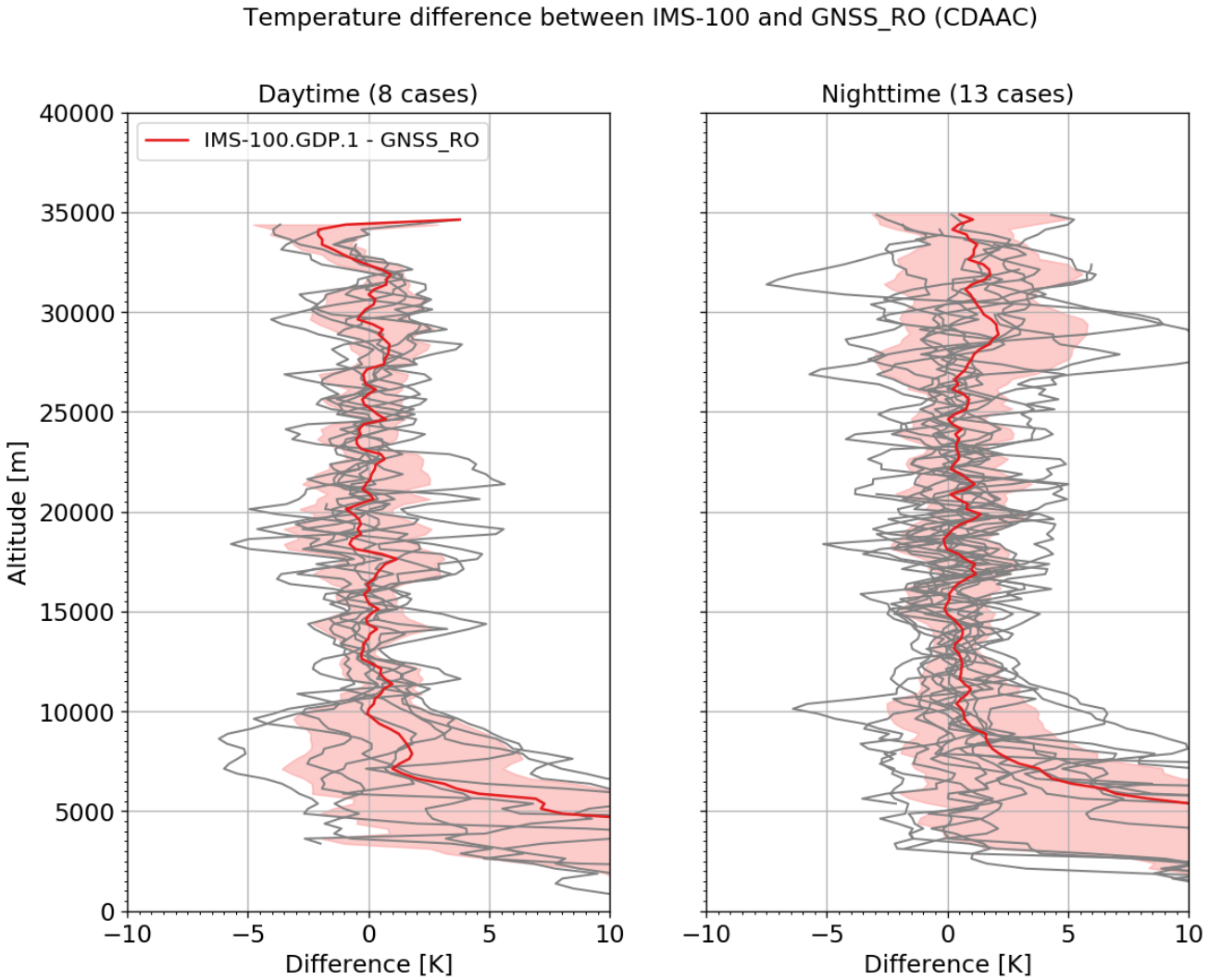
RS-11G / iMS-100 / RS92 vs CFH



RS-11G / iMS-100 / RS92 vs CFH



Comparison of temperature with GNSS_RO

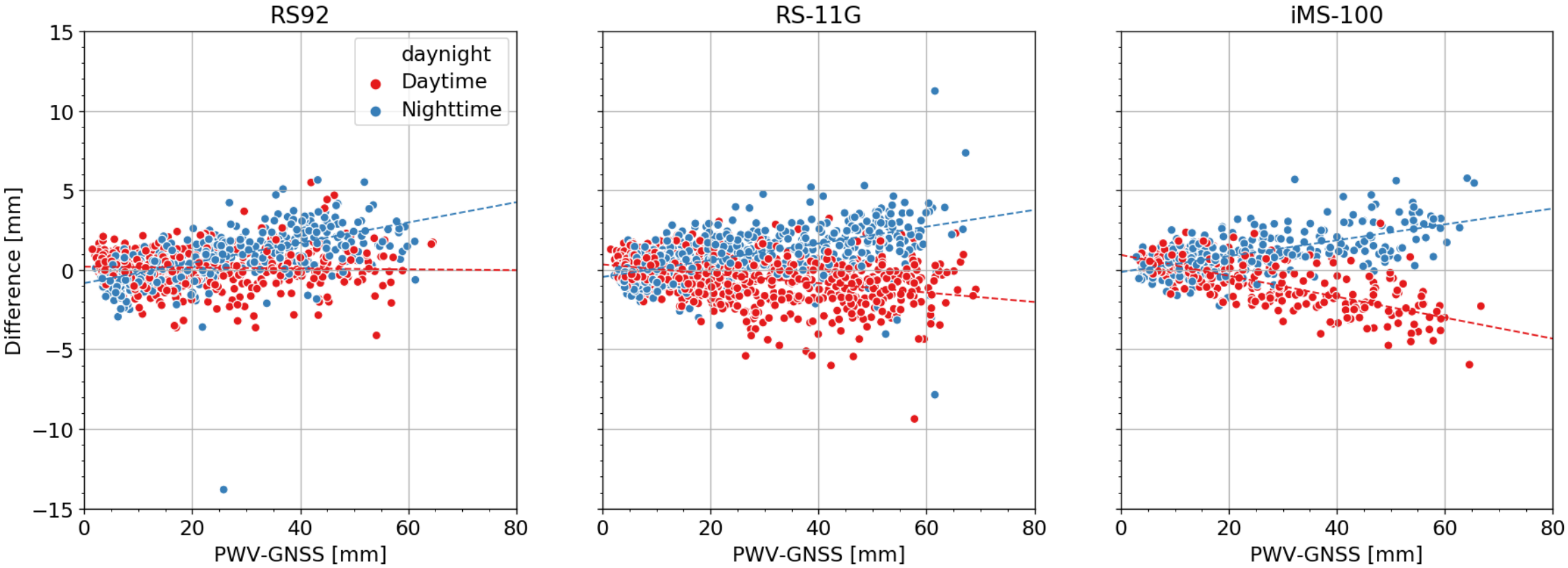


Comparison with GNSS_RO (Metop-A and Metop-B atmPrf products by CDAAC)

Collocation: ≤100 km and ± 90 minutes

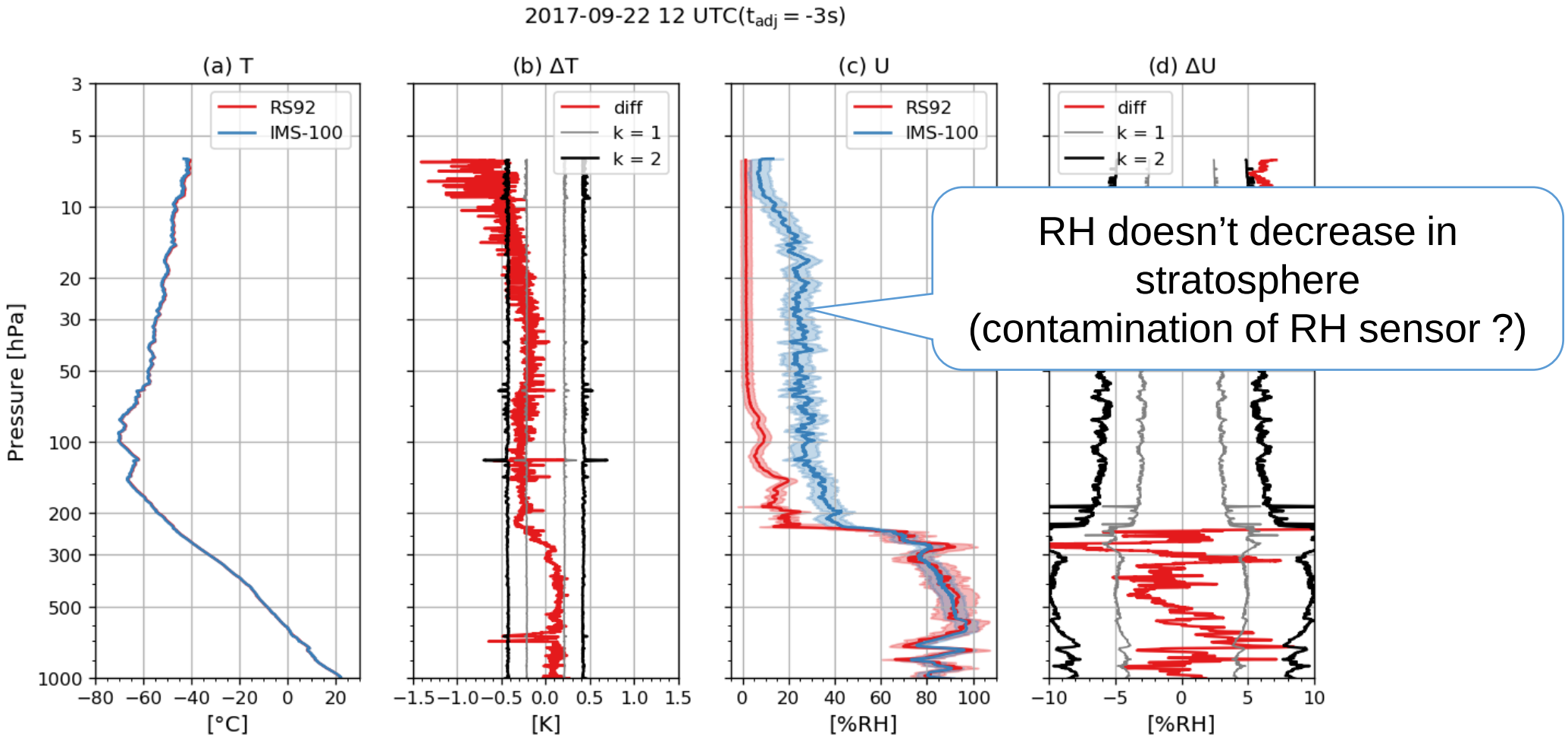
- The difference below 8 km altitude is too large
- Mean difference in 10 – 25 km is relatively small, but slightly high in nighttime

PWV Comparison with GNSS



In comparison for daytime data, there seems to be no correlation between GNSS-PWV and dPWV for RS92, but are negative correlation (drier as PWV increases) for RS-11G and for iMS-100. (Dashed lines are robust regression model)

Questionable RH case



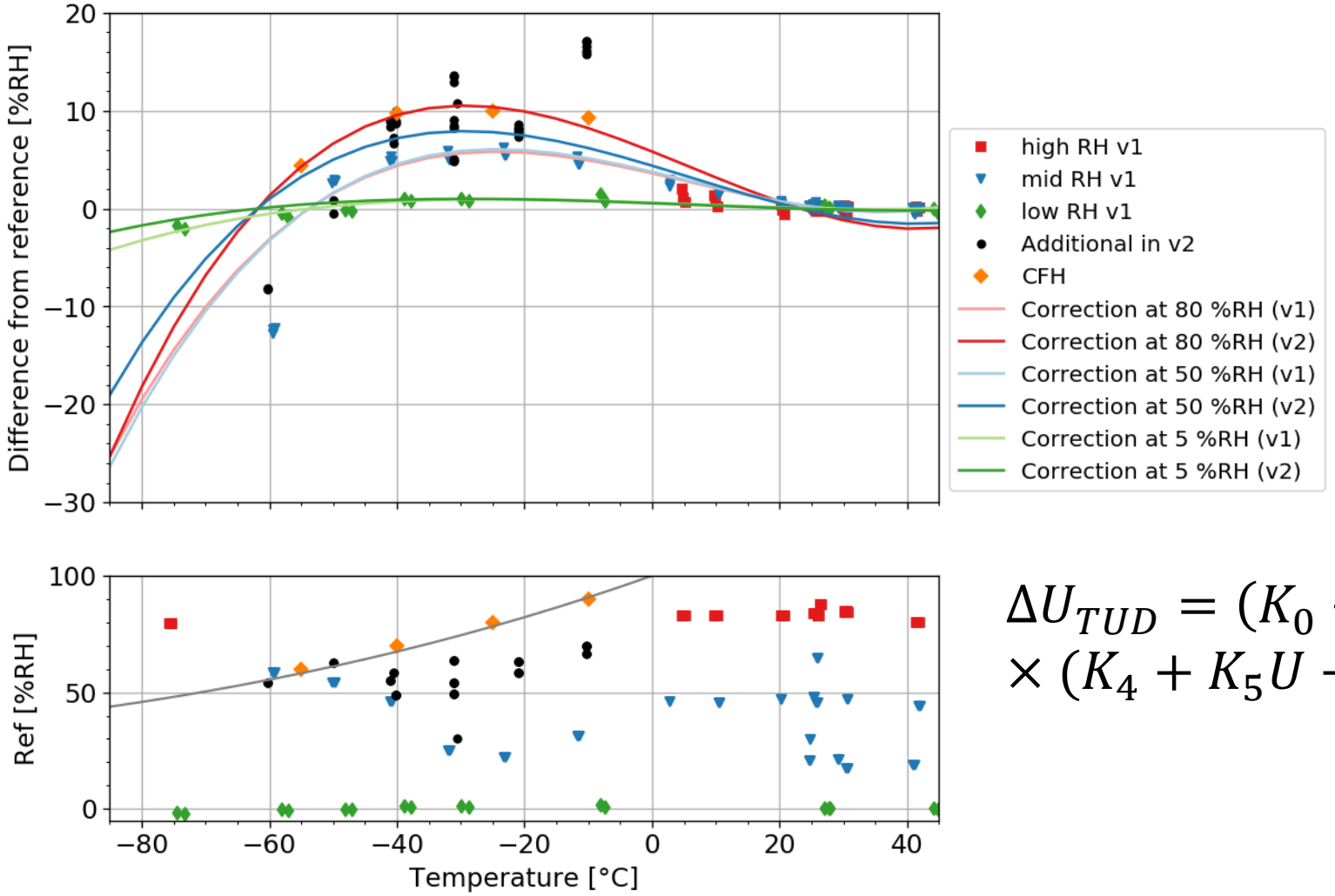
Issues

- Establishment of quality assessment method for Meisei radiosondes (QC-flag parameter?)
- Improvement of processing algorithm
  - Radiation correction: evaluation of the heating effect by solar radiation (and ventilation)
  - RH correction: change of RH-sensor temperature estimation near surface and coefficients for temperature-humidity dependence (TUD) correction
- Comparison with RS41 (after the autumn of 2019?)
- Evaluation using observations at Syowa, Minamitorishima and other special campaigns

Improvement of processing algorithm of RH

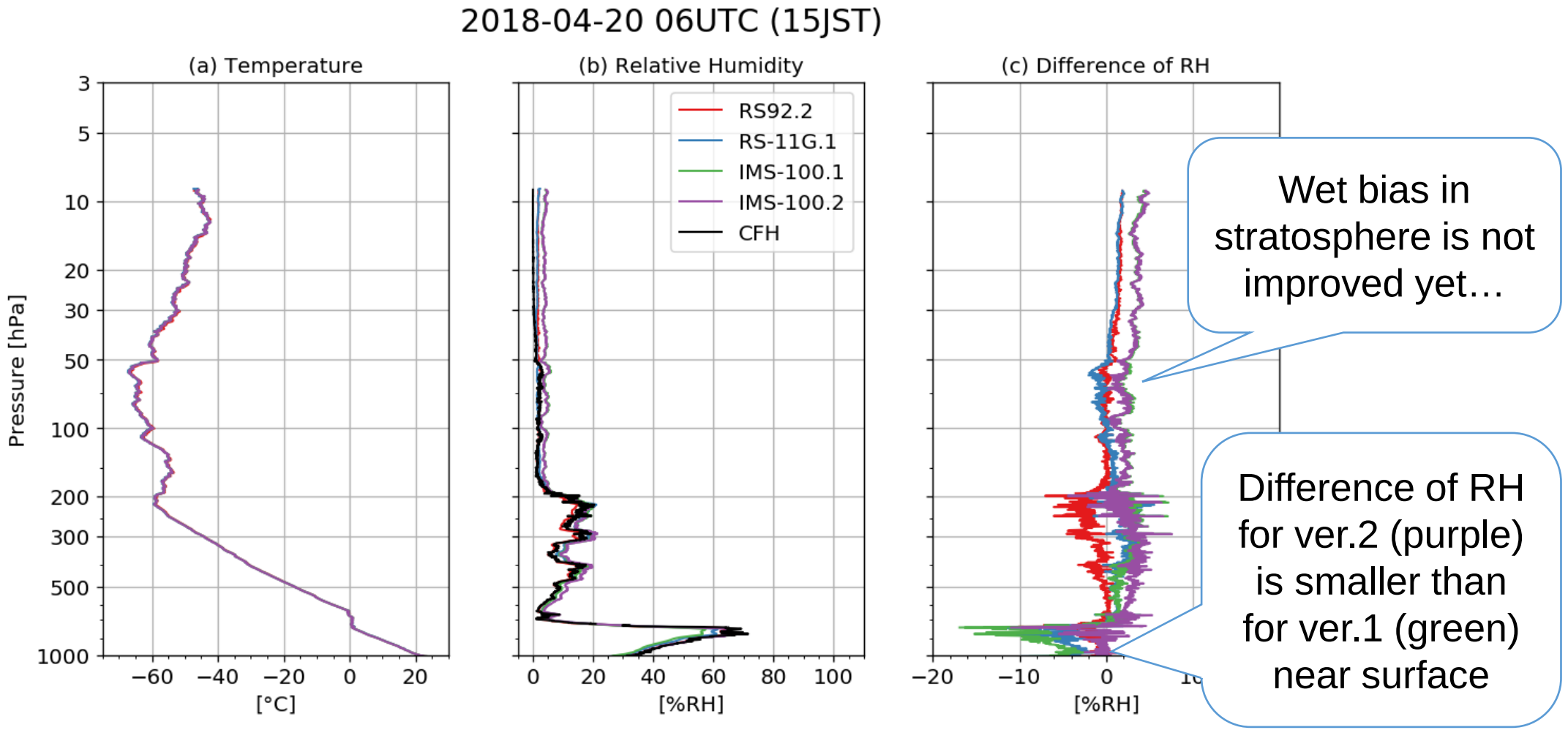
- For IMS-100-GDP ver. 1, the air temperature is used for the temperature of RH-sensor instead of actually observed value for P > 600 hPa. For ver. 2, the actually observed value with the correction of bias caused by heat capacity of TU substrate will be used for all layers.
  - For RS-11G-GDP, the temperature of RH-sensor estimated using air temperature will be used for all layers.
- The additional experiment and CFH observation results in Bengkulu, Indonesia (by JAMSTEC) for the condition with low temperature and high relative humidity appended to the data for the calibration for TUD correction.

Improvement of TUD correction

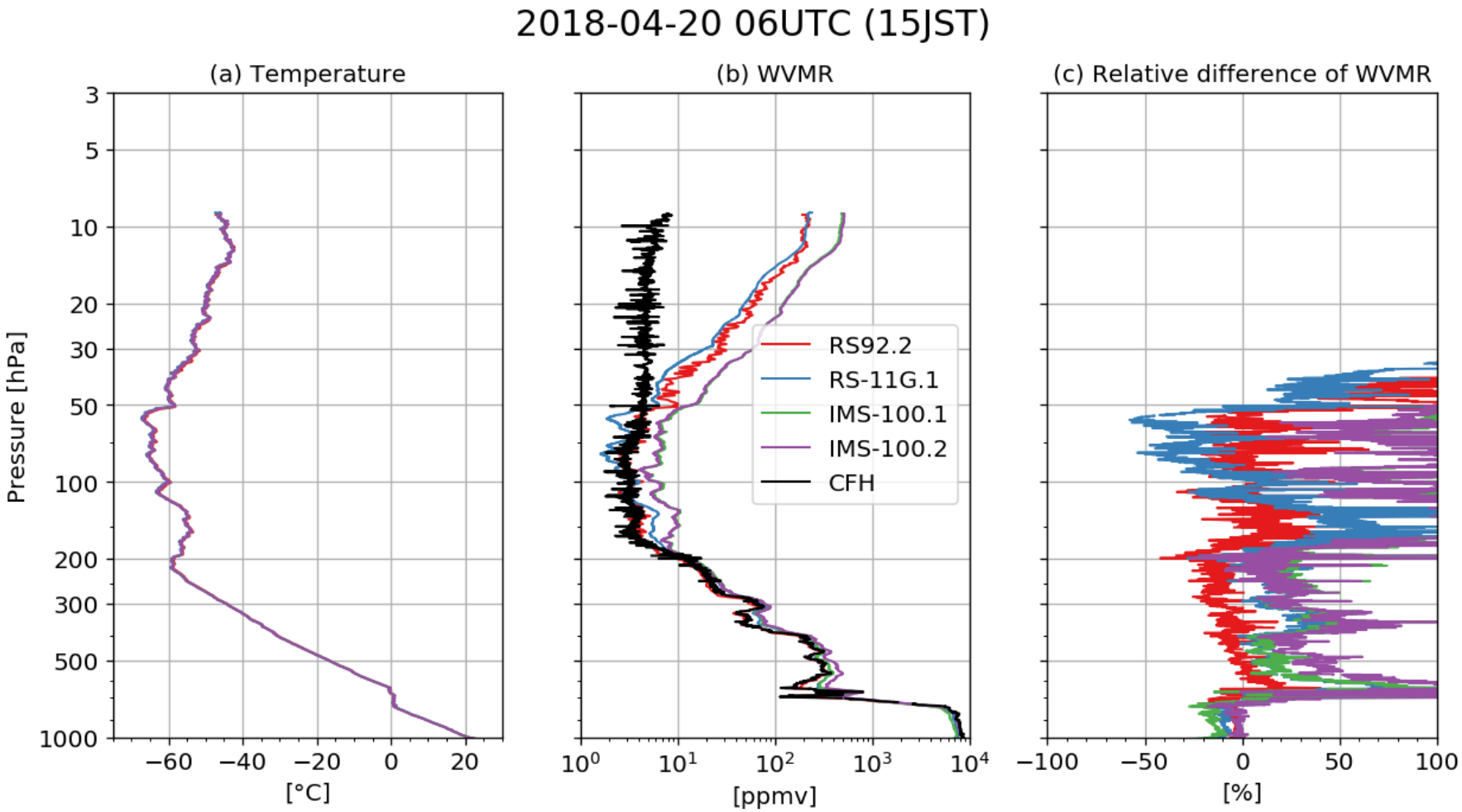


$$\Delta U_{TUD} = (K_0 + K_1 T_s + K_2 T_s^2 + K_3 T_s^3) \times (K_4 + K_5 U + K_6 U^2)$$

IMS-100-GDP ver. 2 (under development)

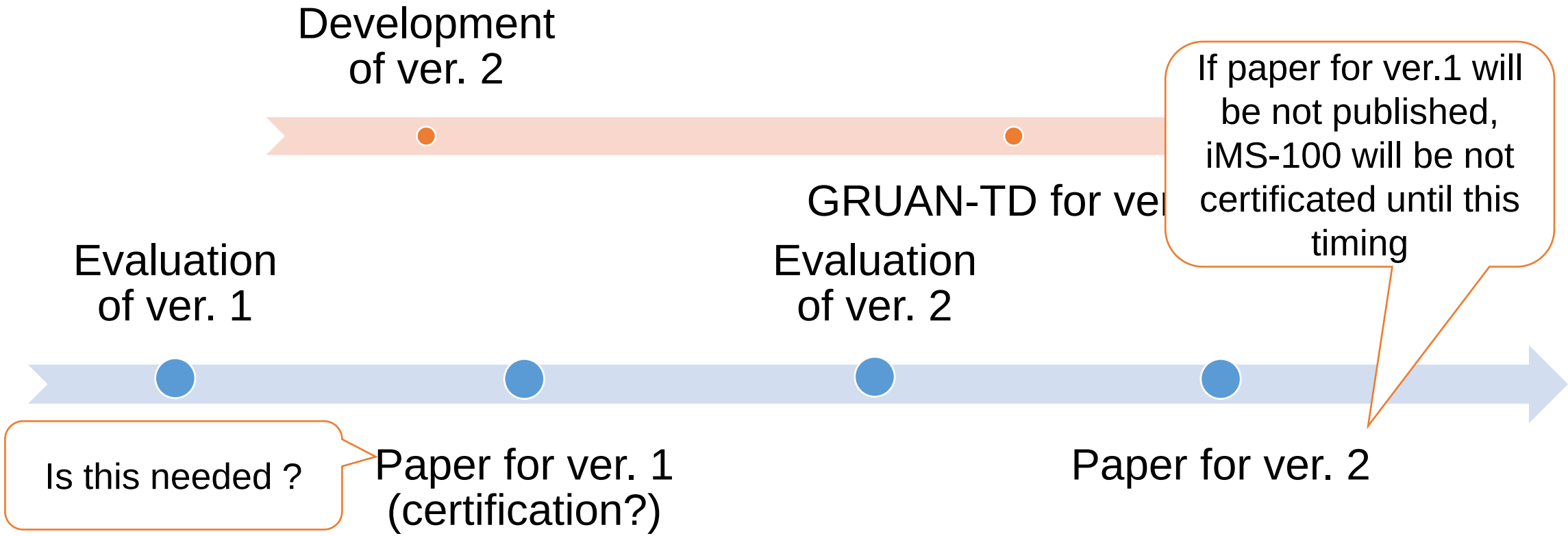


RS-11G / iMS-100 / RS92 vs CFH



Discussion about update process

- The update of processing method is planned, so when the paper for iMS-100 is submitted?



Thank you !