



GOBIERNO
DE ESPAÑA

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DE AGRICULTURA, ALIMENTACIÓN
Y MEDIO AMBIENTE

Aemet
Agencia Estatal de Meteorología

Consistency for water vapour of GRUAN, LBLRTM and IASI

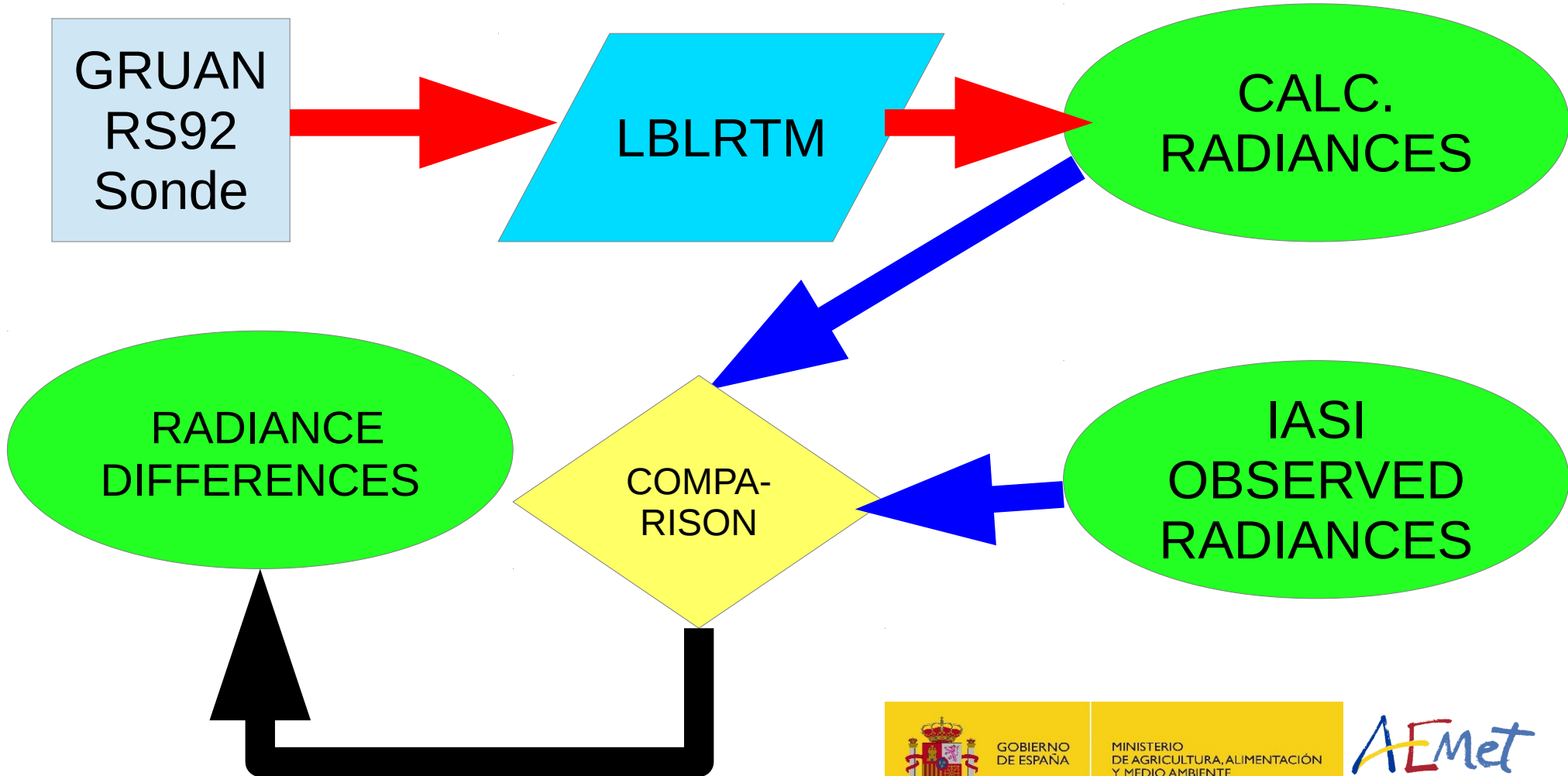
Collocation: best practices and related uncertainties

Xavier Calbet (xcalbeta@aemet.es)

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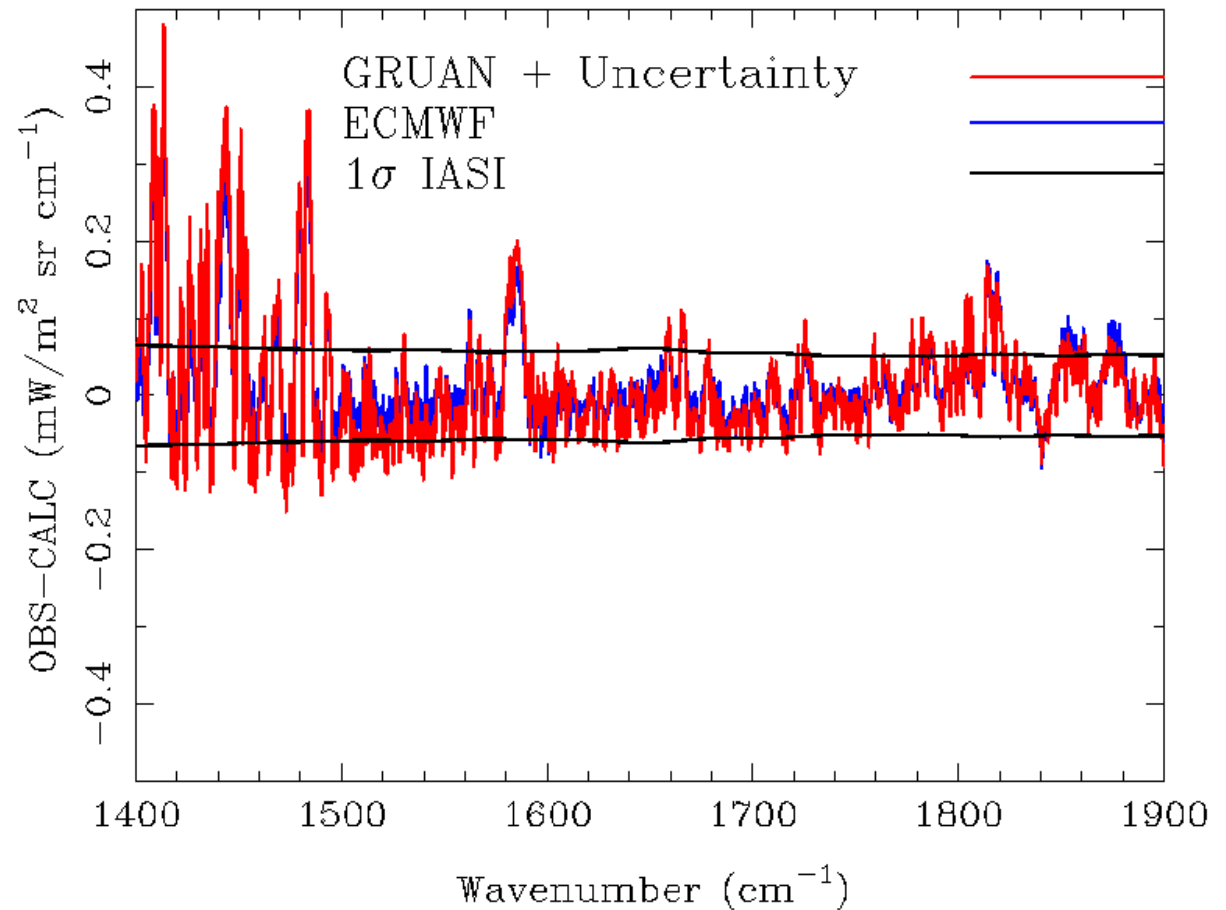
PRINCIPLE



Radiation Bias: Final Result

OBS-CALC Bias. GRUAN + HylandAndWexler Sat. Vap. Press.

Only 11
cases left!!



CONCLUSIONS

- GRUAN and IASI are **compatible!!**
- There are many **critical issues**:
 - Adequate **collocation**: scale lengths and times of WV are extremely small (**~ 2-6 km, 10-40 min.**) ← [Steinke et al. 2015, Vogelmann et al. 2015 and results from these GRUAN collocations]
 - Water Vapour **saturation function**: Hyland and Wexler needed
 - **GRUAN processing needed!!** Mostly for humidity bias correction
 - Proper **cloud detection** is critical
 - GRUAN processing seems to have a **dry bias for daytime**

COLLOCATION UNCERTAINTY

Immler et al. 2010: two measurements are consistent when with

$k \approx 2$

and m_1, m_2 measurements **1 (satellite)** and **2 (reference, e.g. sonde)**

with u_1, u_2 uncertainties **1 (satellite)** and **2 (reference, e.g. sonde)**

and σ is the different measurement uncertainty (mostly collocation)

$$|m_1 - m_2| < k \sqrt{\sigma^2 + u_1^2 + u_2^2}$$

COLLOCATION UNCERTAINTY versus REFERENCE MEASUREMENT for HUMIDITY

TYPE OF REFERENCE OBSERVATION	EXAMPLE	RESULT
One “point” observation	Only one sonde	$\sigma > u_1$
Two “point” observations	Two sondes, LIDAR?, etc.	$\sigma \sim 0$
Unbiased measurement	CFH Sonde	No bias
Biased measurement with GRUAN pre-flight conditioning and processing	RS92 Sonde with GRUAN processing	Small humidity bias mostly during daytime
Biased measurement with no bias correction	RS92 Sonde	Big humidity bias mostly during daytime
Large collocation window	200 km, 6 hrs	$\sigma \gg u_1$

COLLOCATION UNCERTAINTY FOR INDIVIDUAL CASES

- **No conclusive** results yet
- If properly determined, it could **quantify** the values of σ in the previous table
- Could make the full comparison of Immler et al. with all the **uncertainties known σ , u_1 , u_2**
- Could σ be quantified with the help of **NWP fields?** Perhaps not, if really WV scale length is so small and its scale length correlation is also small
- **More work** on this needed