“IAGOS-based” approach for improving atmospheric process understanding / quantification

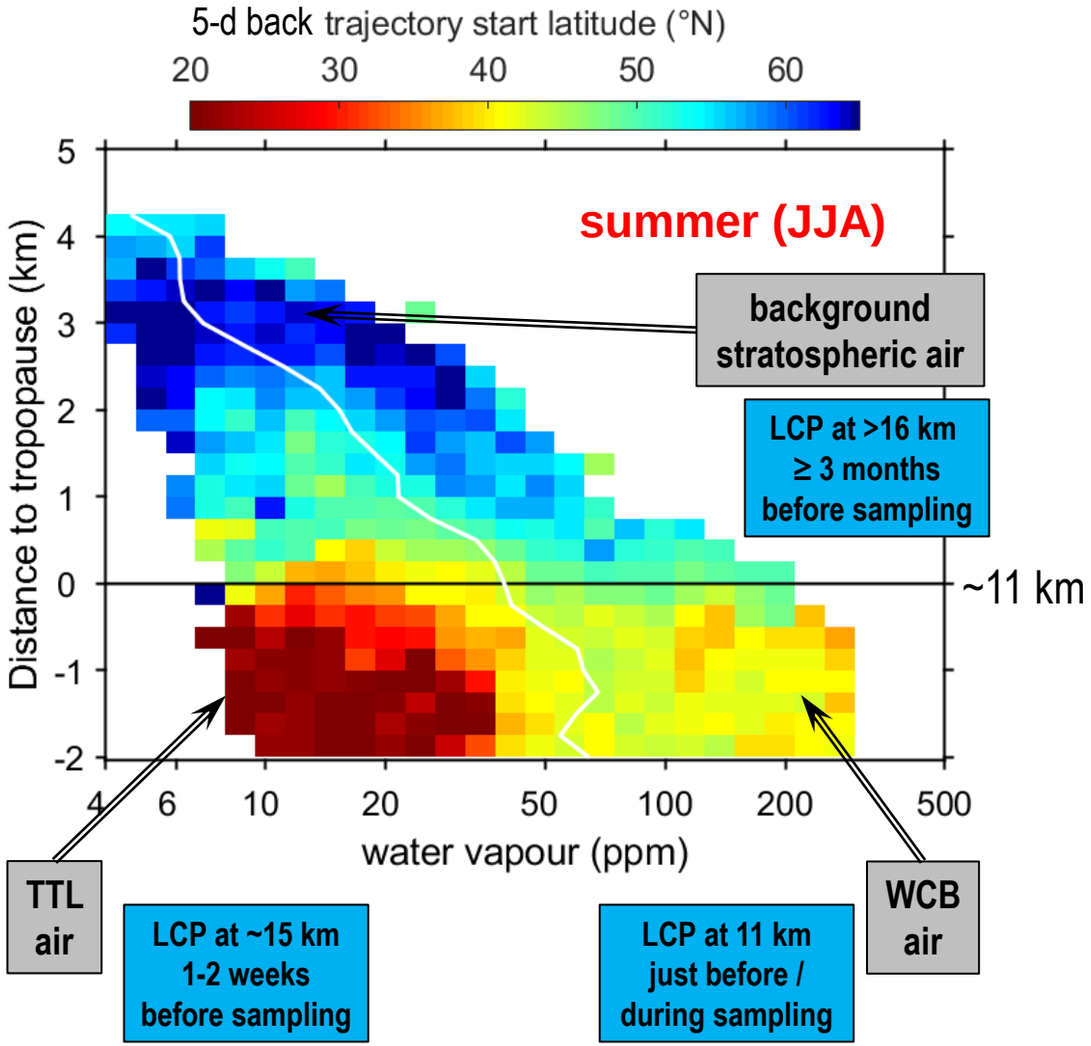
Andreas Zahn and the **IAGOS team**

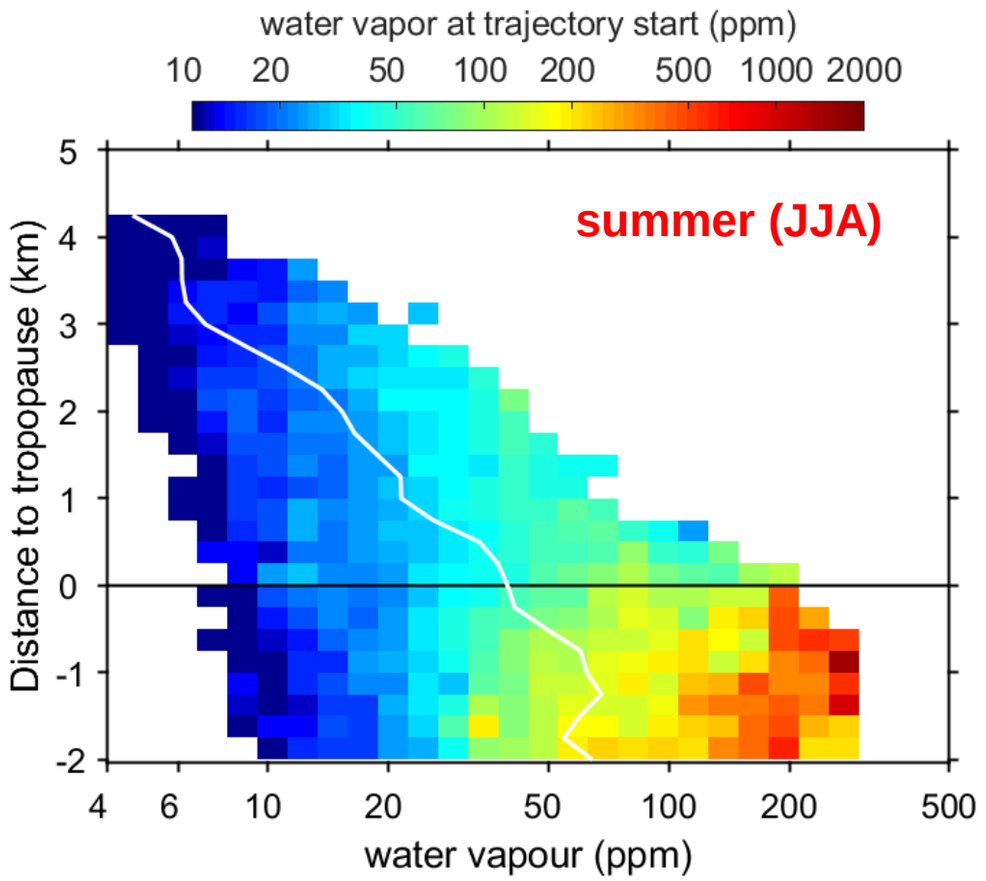
IAGOS data based improvement of atmospheric processes ?

- No case studies
- Categorization of IAGOS-data … to stastically evaluate
  - Occurrence frequency of processes (phenomenon, chemical fingerprint)
  - Together with strength/magnitude assessment of importance
  - … „which process matters“?
- Assessment of (process-related) performance of models and impact on radiative budget

Example 1: H_2O relative to mid-latitude tropopause

35 – 80°N, (227 ± 20) hPa





Where a model does a good job, where a bad one, and why?

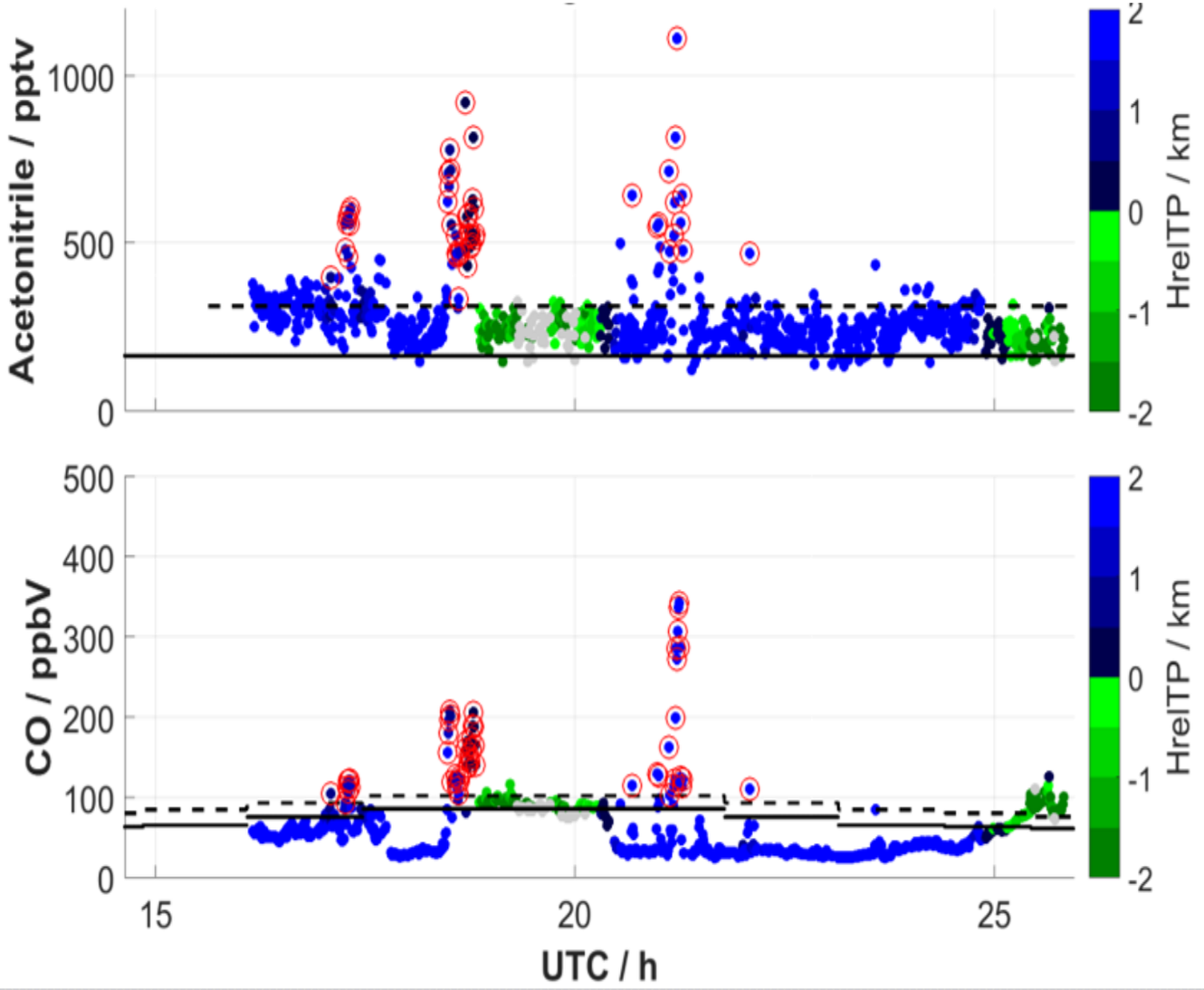
Zahn et al., Processes controlling H_2O in UTLS, JGR, 2014

Example 2: impact of biomass burning in UT (CO, acetonitrile)

BB plume identification

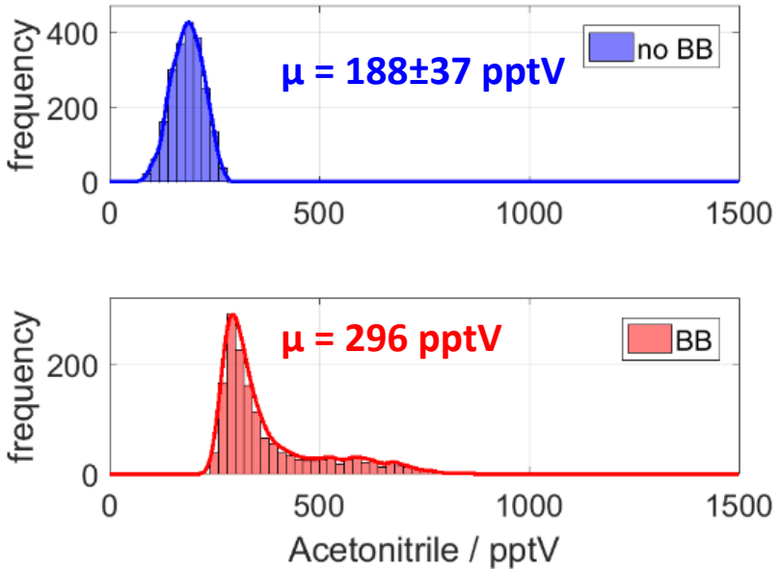
$CO > CO_{background}(month, lat) + 4\sigma(month, lat)$ $AN > AN_{background}(winter, NH) + 4\sigma_{inst}(flight)$

Munich to
San Francisco
19.08.2014

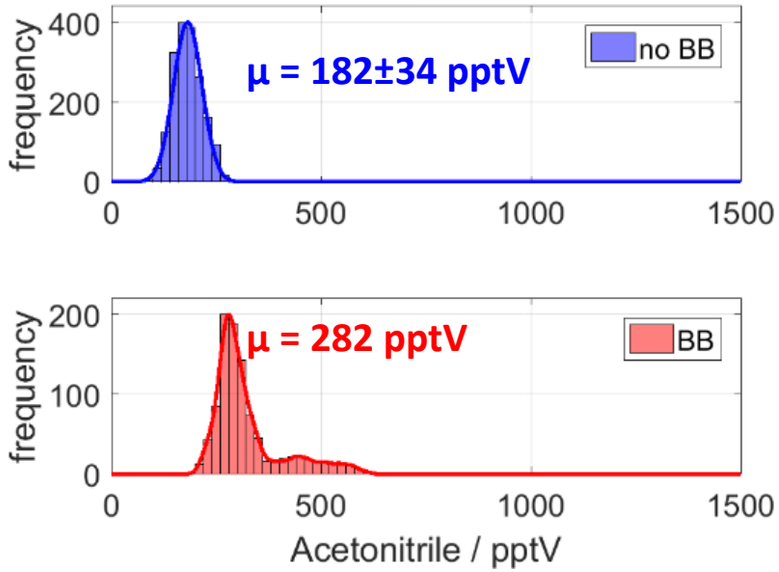


Occurence frequency of BB in UT (2012 – 2016)

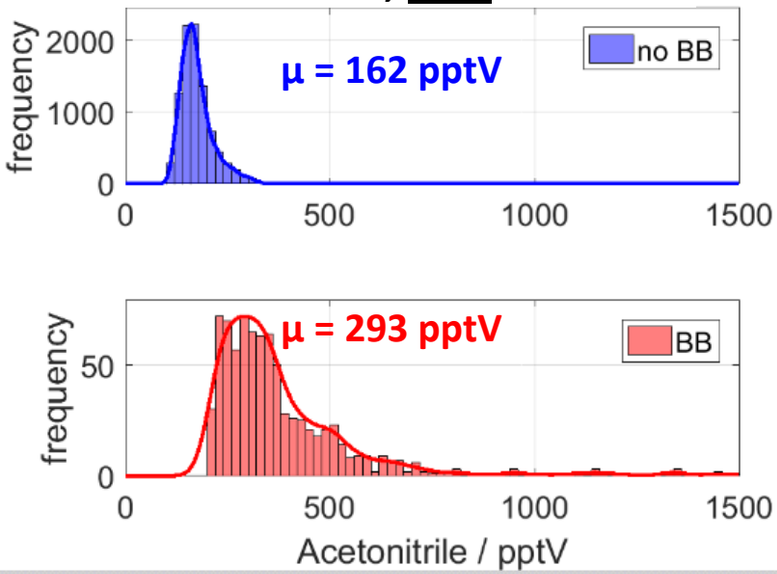
Africa, DJFM



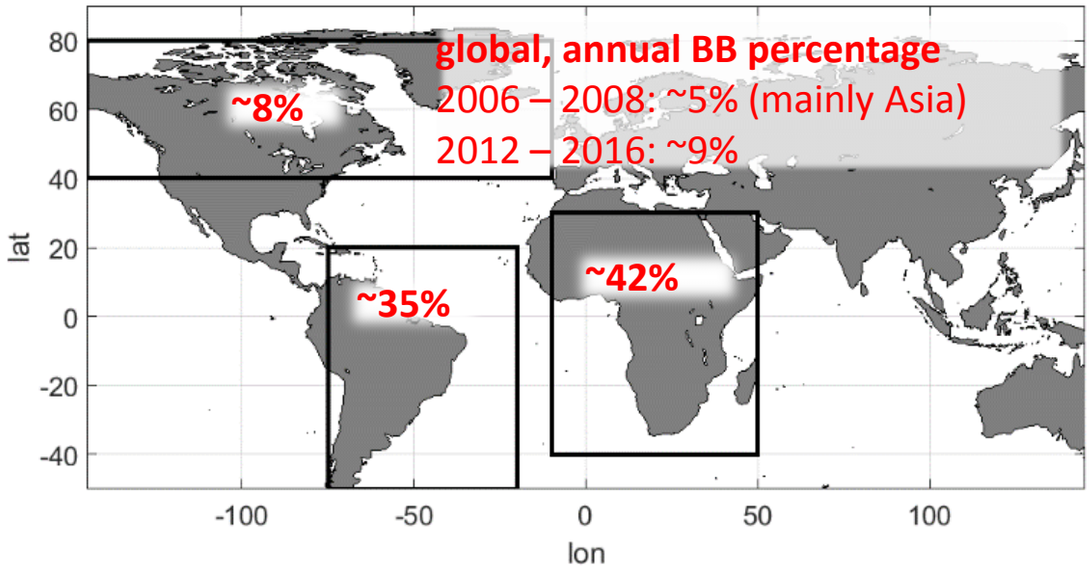
South America, DJFM



North America, JJAS



Percentage of sampled BB



Example 3

www.nature.com/scientificreports

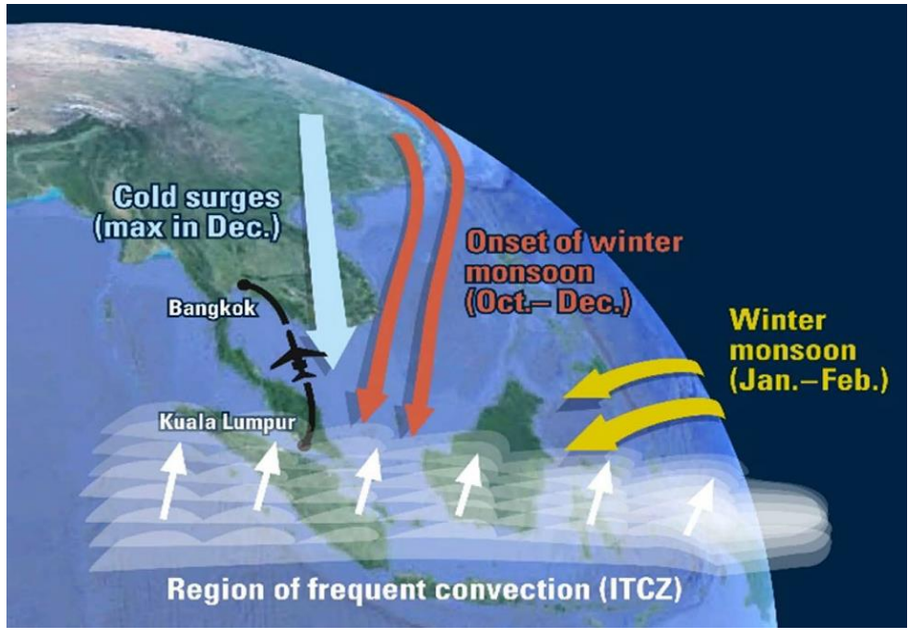
SCIENTIFIC REPORTS

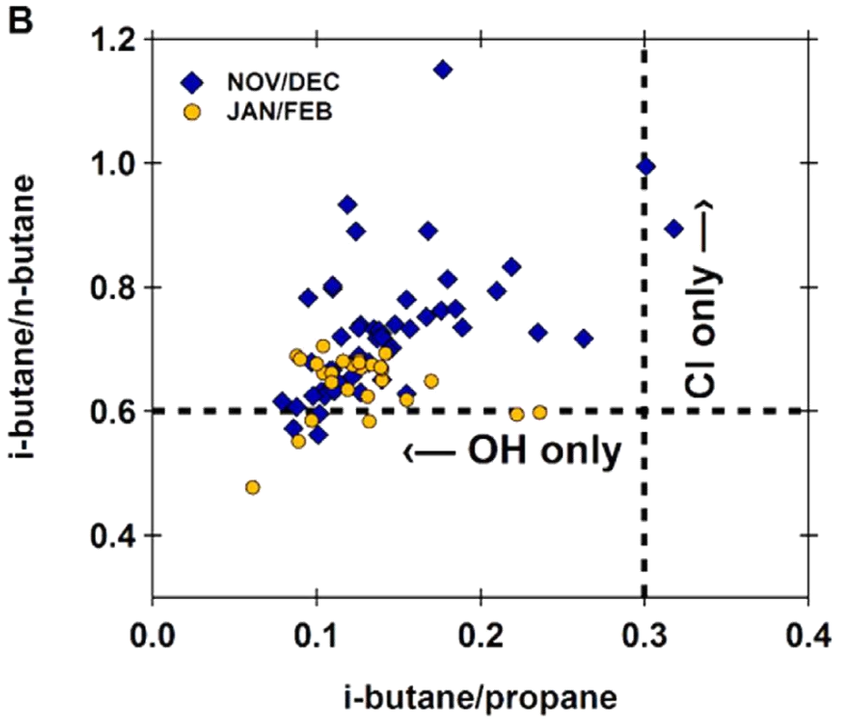
OPEN

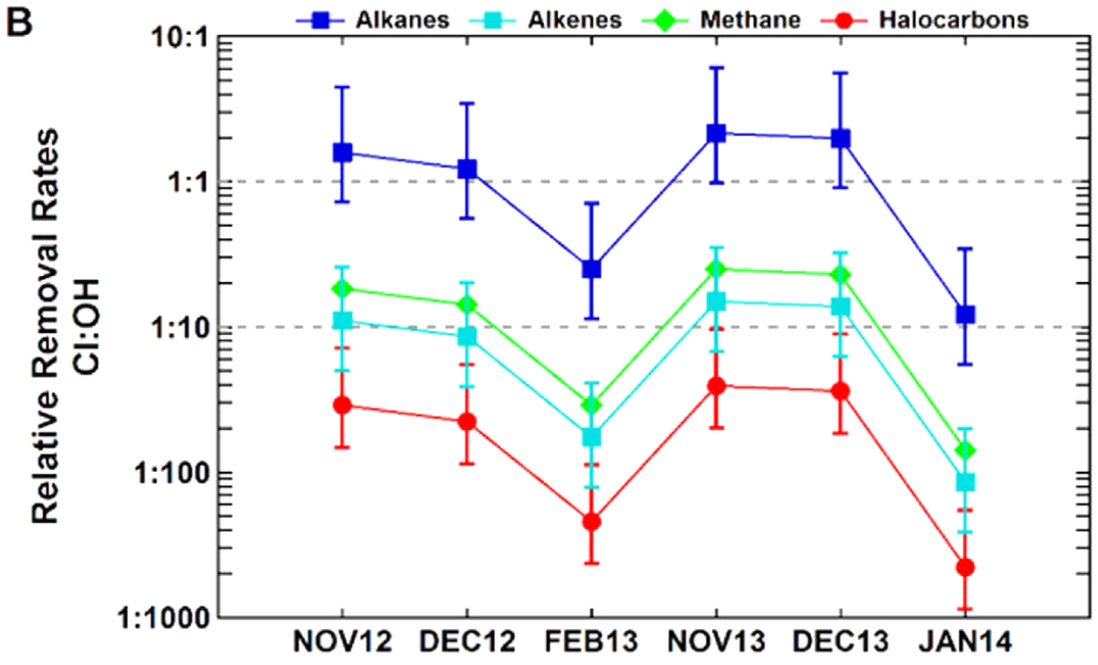
Evidence for strong, widespread chlorine radical chemistry associated with pollution outflow from continental Asia

Received: 06 June 2016
Accepted: 21 October 2016
Published: 15 November 2016

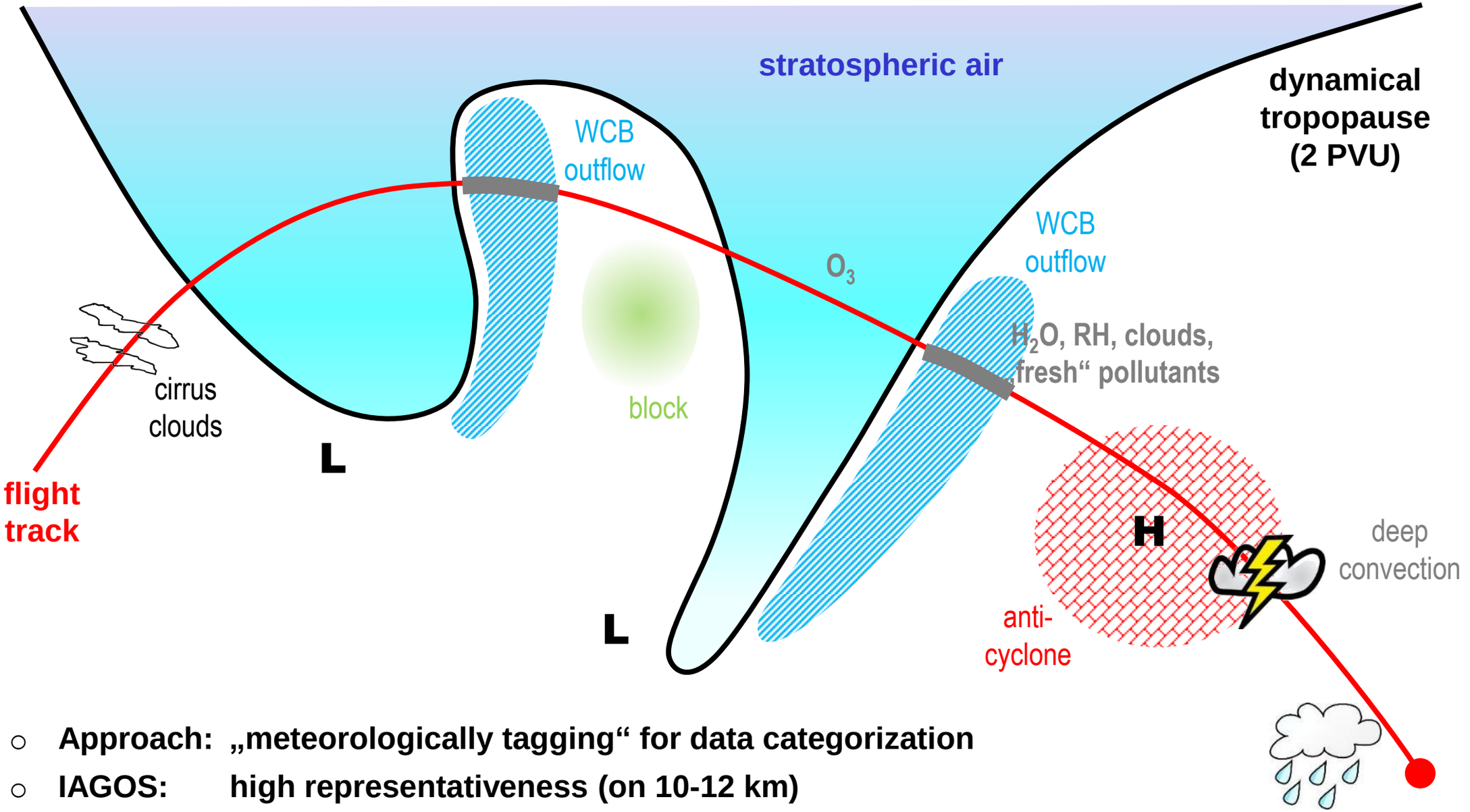
Angela K. Baker[1], Carina Sauvage[1], Ute R. Thorenz[1], Peter van Velthoven[2], David E. Oram[3], Andreas Zahn[4], Carl A. M. Brenninkmeijer[1] & Jonathan Williams[1]





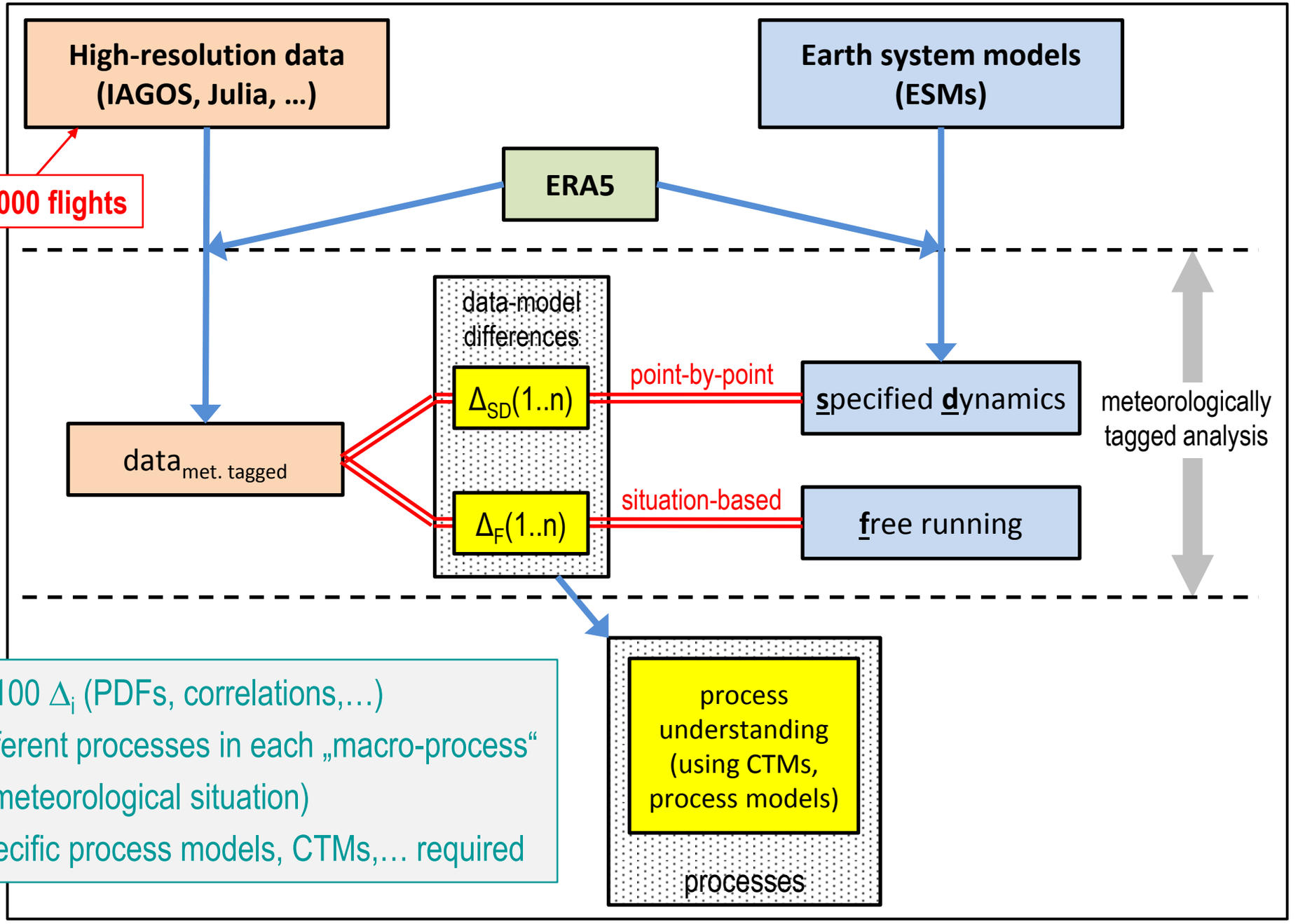


… dynamical complexity of extratropical TP region



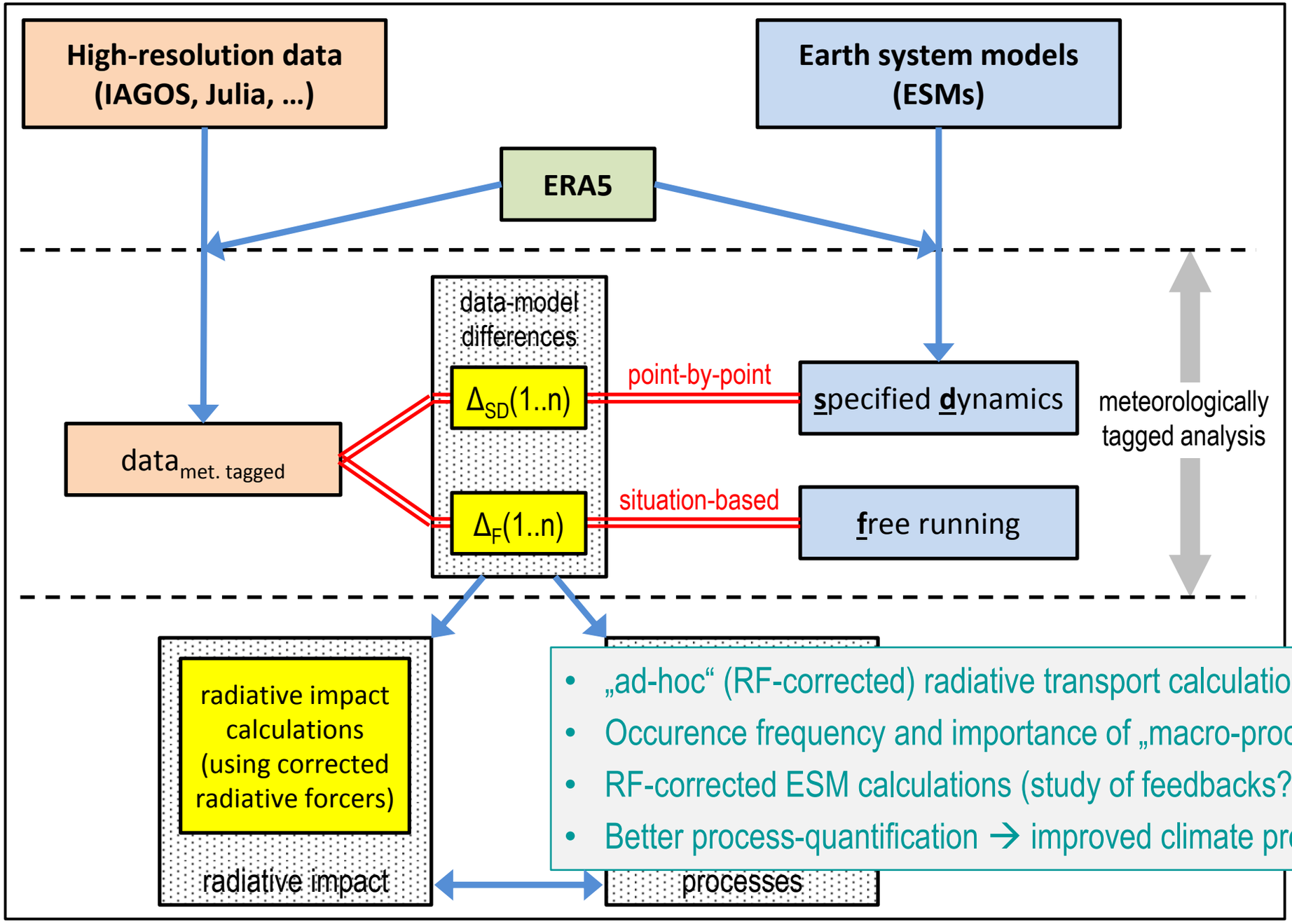
- **Approach: „meteorologically tagging“ for data categorization**
- **IAGOS: high representativeness (on 10-12 km)**
  many monitored process-tracers

Proposal: Assessing Climate Change Projections by Confronting Models with High-Resolution Aircraft Observations (CLIMATO)



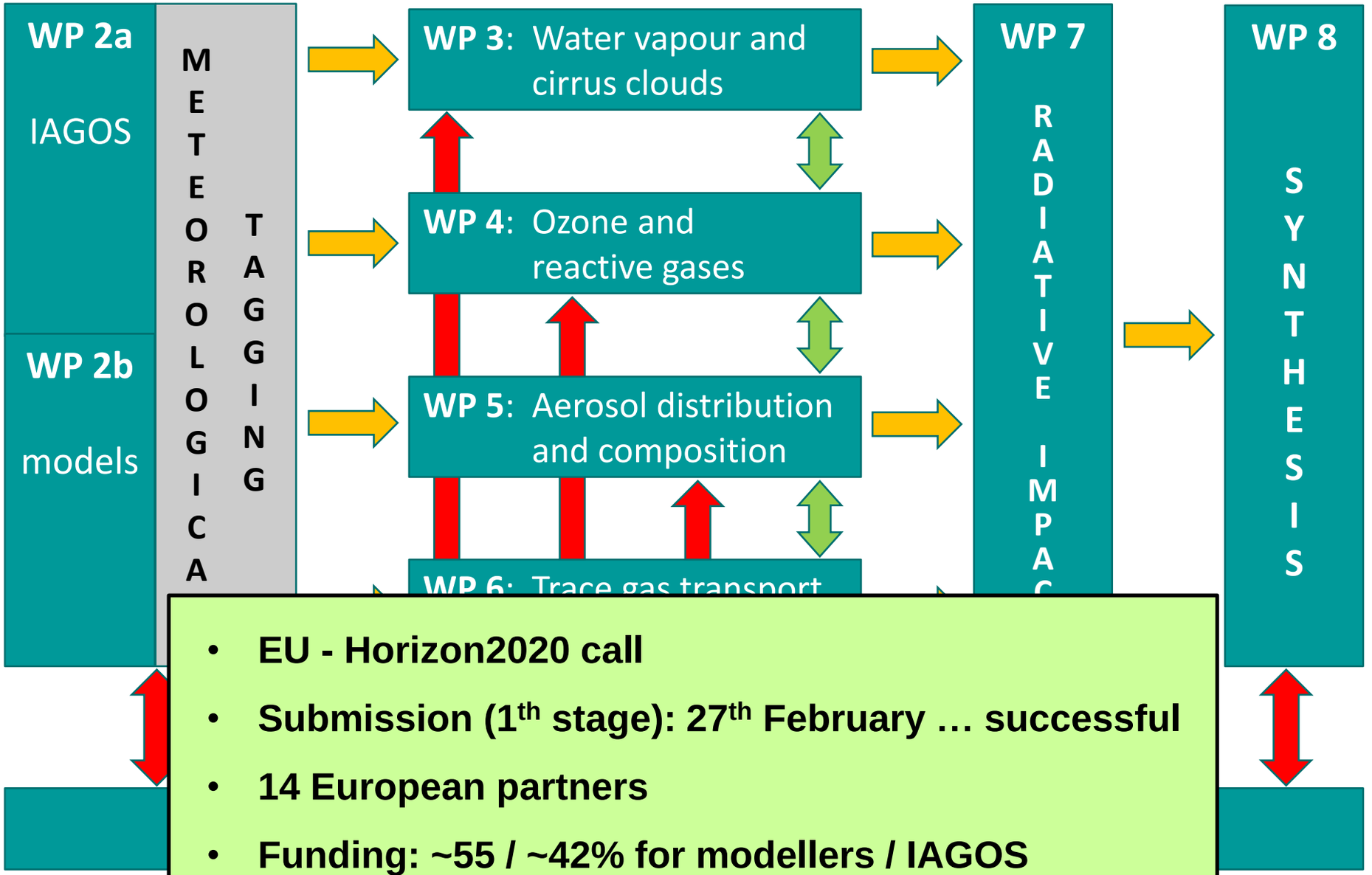
- >>100 Δ_i (PDFs, correlations,…)
- Different processes in each „macro-process“ (meteorological situation)
- Specific process models, CTMs,… required

Proposal: Assessing Climate Change Projections by Confronting Models with High-Resolution Aircraft Observations (CLIMATO)



CLIMATO

Assessing Climate Change Projections by Confronting Models with High-Resolution Aircraft Observations



- **EU - Horizon2020 call**
- **Submission (1th stage): 27th February … successful**
- **14 European partners**
- **Funding: ~55 / ~42% for modellers / IAGOS**
- **Submission (2th stage): 4th September**