



# A Planetary Boundary Layer Height Climatology derived from ECMWF Re-Analysis Data

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# Overview

- **Why we do this**
- **What data do we use**
- **What do we find**
- **What do we not understand**
- **What do we conclude**

# Why we do this

- **CHAMP GRL article prompted several researchers to ask for more data**
- **CHAMP data set had only limited coverage and large noise**
- **ECMWF has shown to provide reliable ducting information**
- **Climatology could be used as a constrain in the retrieval of PBL height from radio occultation data**



# What data do we use (I)

- **ECMWF Data:**
  - ERA-Interim Analysis, 1990 – 2009, 1 Degree resolution, 60 hybrid levels, 4 analysis times
  - ERA-Interim Forecast, 2000, 1 Degree resolution, 60 hybrid levels, for selected variables, 4 analysis times
  - ERA40, 2000, for comparison
- **AWI Radio Sonde Data:**
  - launched from ship Polarstern, 1990 – 2009, Vaisala

# What data do we use (II)

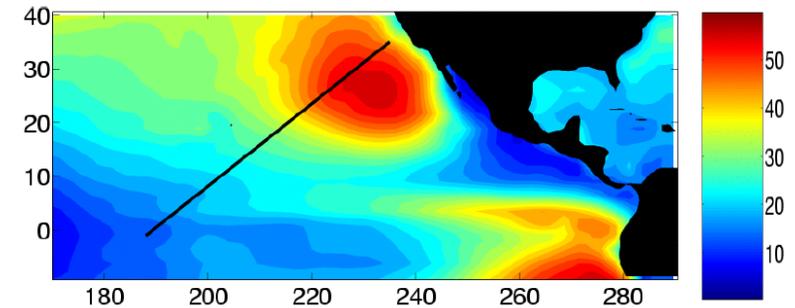
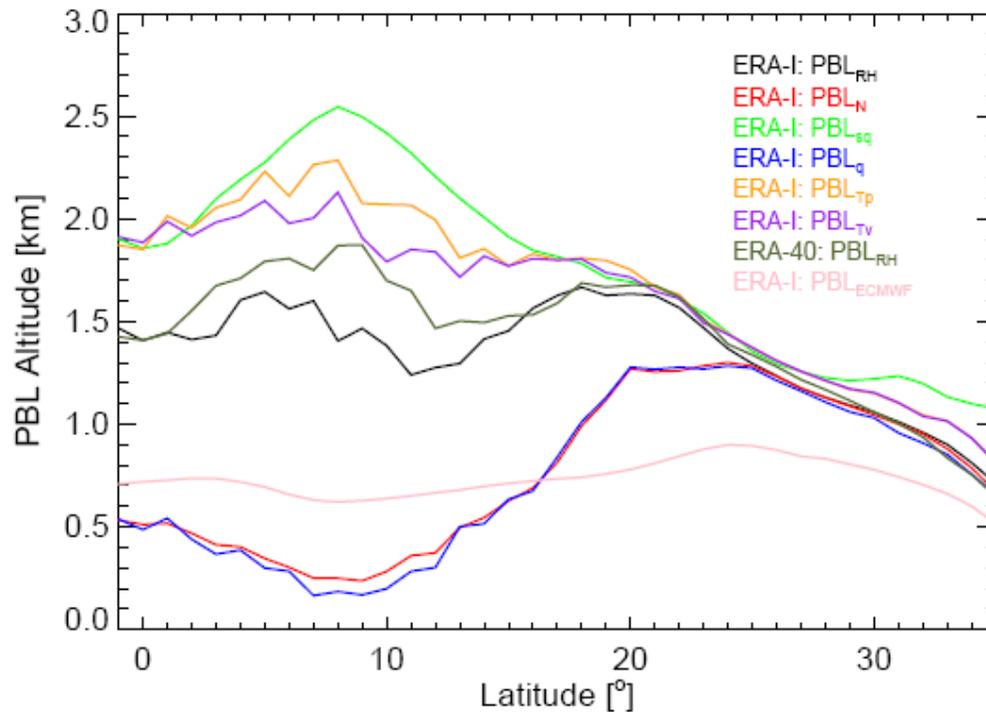


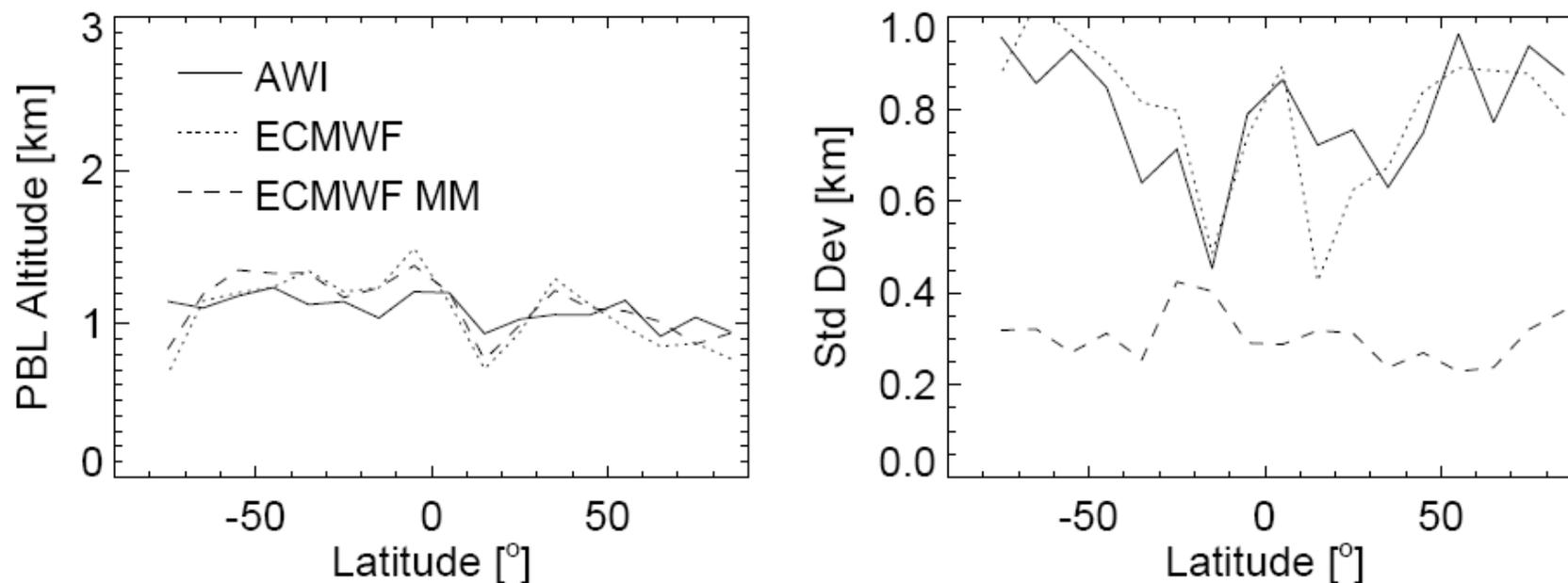
Figure 1 – The GCSS/WGNE Pacific cross-section, from the stratocumulus regions off the west coast of California, across the trade cumulus regions, to the equator together with the ISCCP low cloud cover (in %) climatology for the JJA season.

Map from Teixeira et al, 2010, under review

Figure 1. Different PBL heights definition along transect for season JJA. Only year 2000.

**Selected Relative Humidity Gradient as best method.**

# What do we find: ERA-I Quality



**Figure 3.** Left:  $PBL_{RH}$  altitude derived from AWI radiosondes, co-located ECMWF profiles (ECMWF) and monthly mean ECMWF values (ECMWF MM). Right: Standard deviation found for the 3 data sets. Latitude bins:  $10^\circ$ .

# What do we find: PBL Height vs. Season

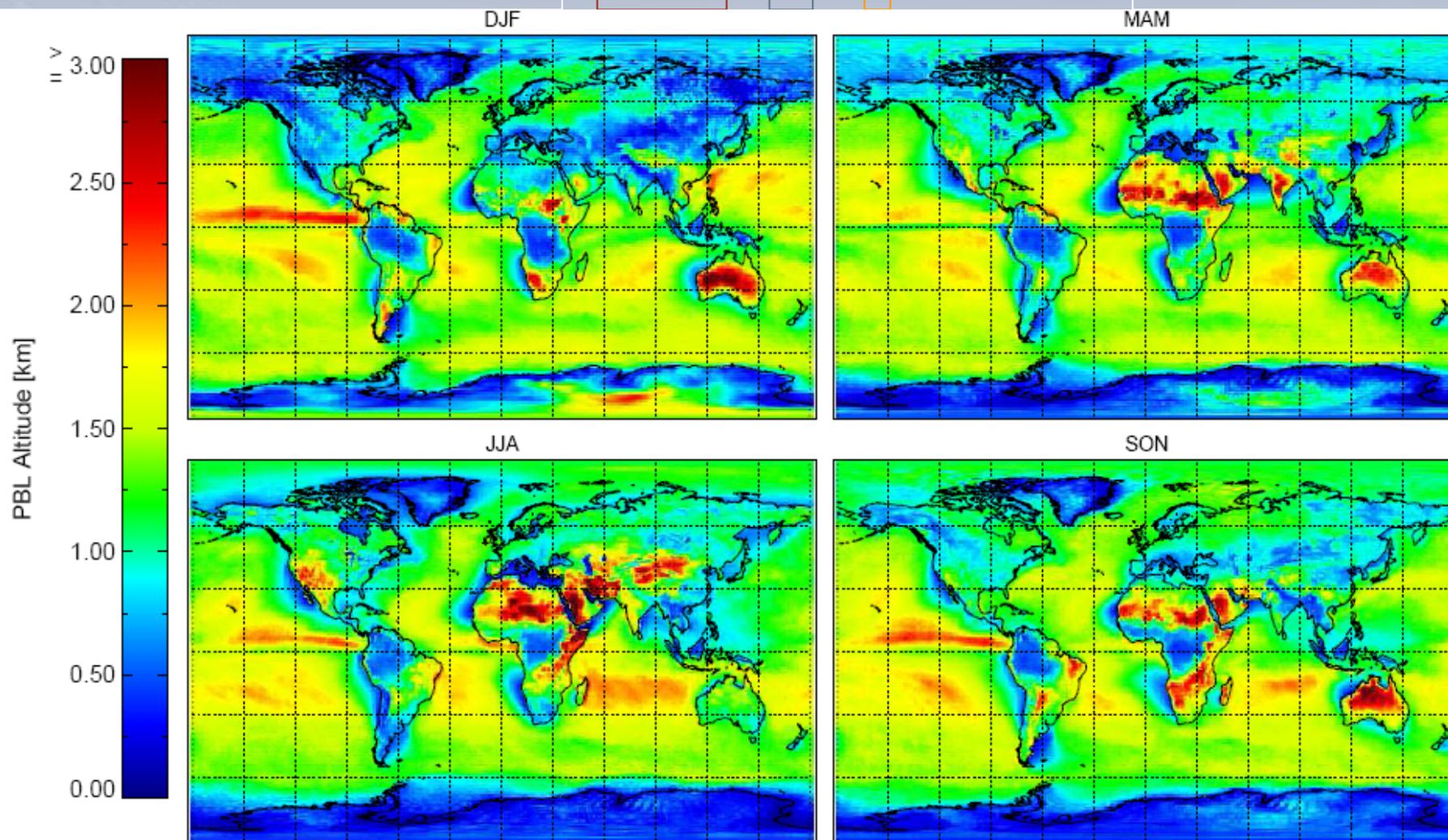


Figure 4. PBL<sub>RH</sub> height for different seasons. Averaged over all years.

# What do we find: PBL Height vs. UT Time

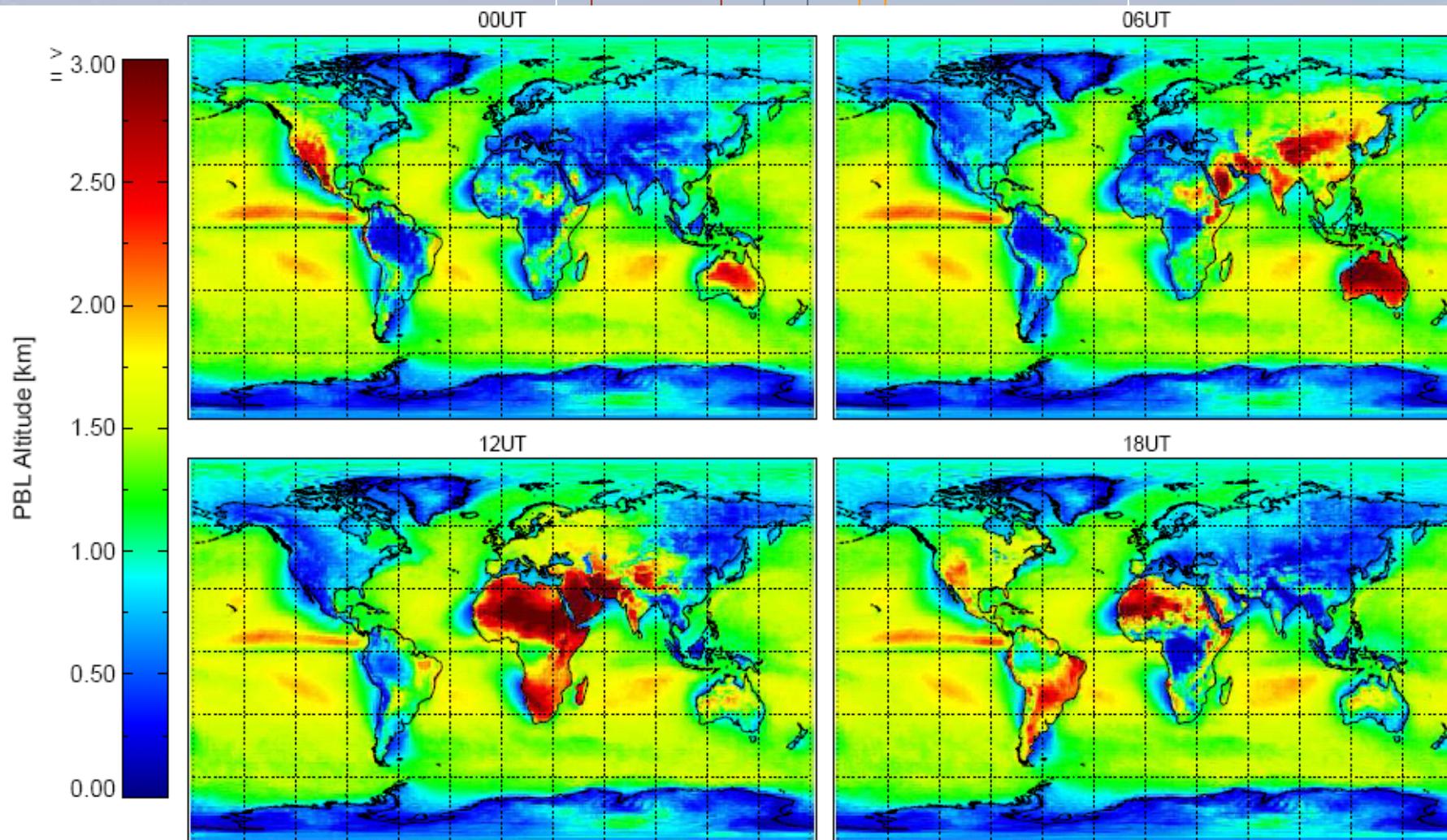
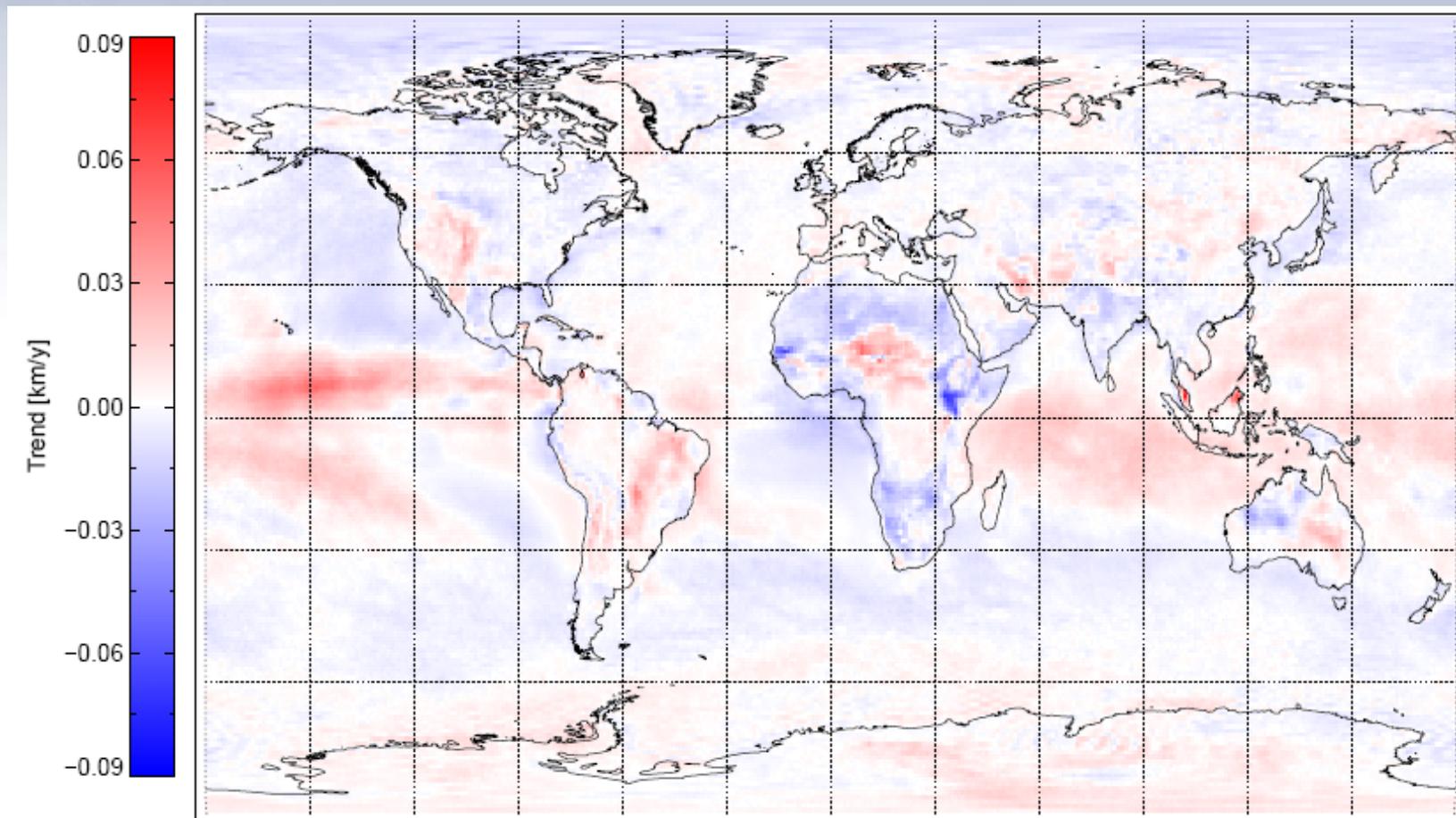
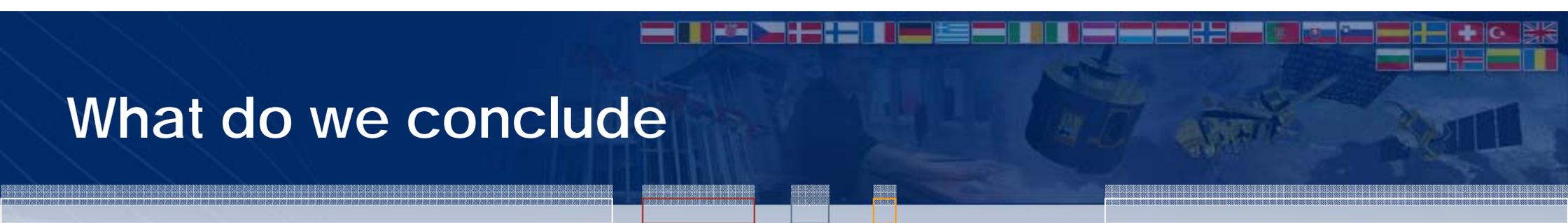


Figure 5.  $PBL_{RH}$  height for different analysis times. Averaged over all years.

# What we do not understand: PBL Height Trends



**Figure 9.** Trend in PBL<sub>RH</sub> height over investigated time range.



# What do we conclude

## Conclusion:

- $PBL_{RH}$  gives a global picture
- ECWMF ERA-I agrees well with radio sonde data
- Climatology could provide useful information
- Trends in  $PBL_{RH}$  are somewhat unexplained, however might actually be real

## Next Steps:

- Plan to make the data set available