# Moisture transport to East Antarctica

## in radiosoundings and reanalyses

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27$^{th}$ October, 2016
Orense

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## Future trends

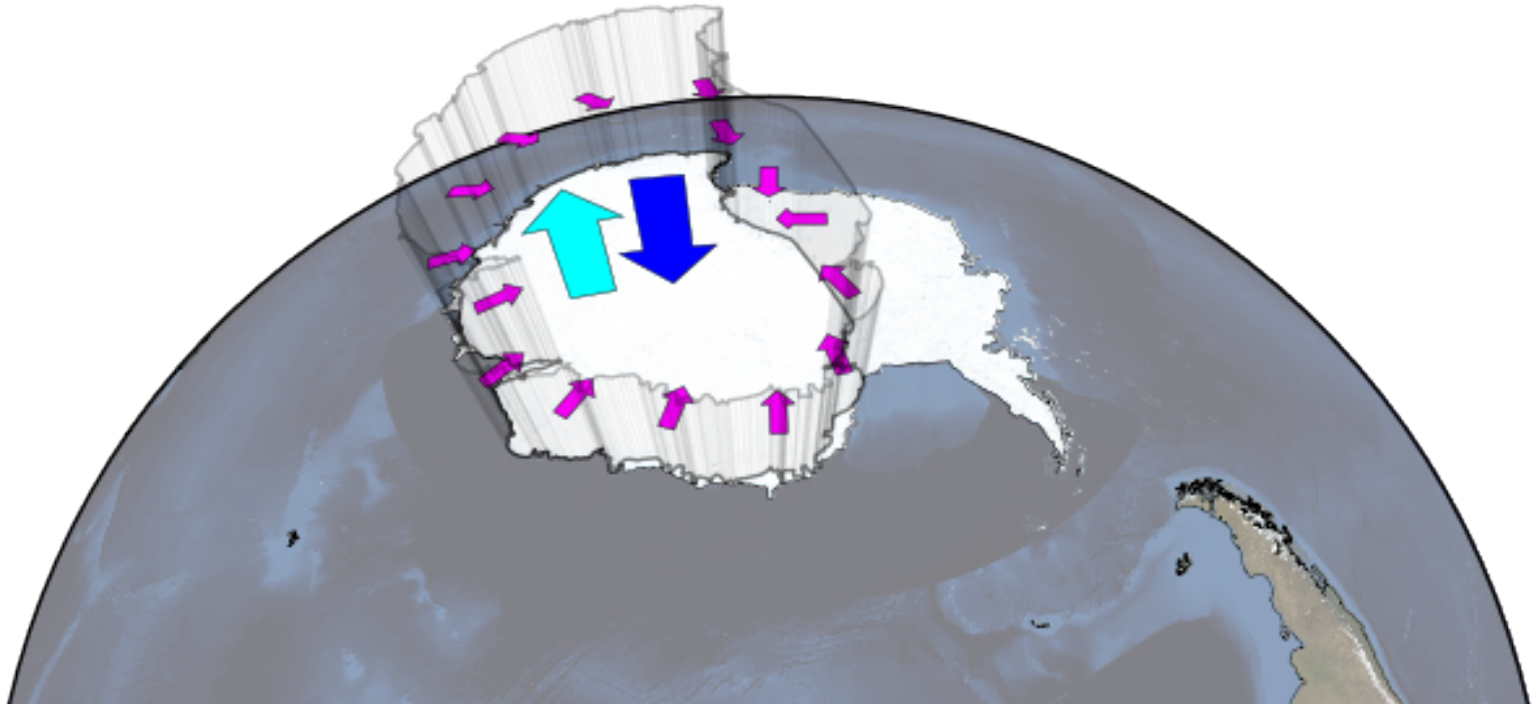
- Water holding capacity of the air increases
- Moisture transport to Antarctica also (e.g. Bengtsson et al. 2011)

# Reanalyses used

| Reanalysis | model vintage | approximate resolution | data assimilation |
|---|---|---|---|
| NCEP NCAR R1 | 1995 | 210 km | 3D-Var |
| NCEP DOE R2 | 2001 | 210 km | 3D-Var |
| JRA 25 | 2004 | 120 km | 3D-Var |
| ERA Interim | 2006 | 80 km | 4D-Var |
| NCEP CSFR | 2009 | 38 km | 3D-Var + FOTO |
| MERRA | 2009 | 55 km | 3D-Var + IAU |
| JRA 55 | 2009 | 55 km | 4D-Var |

# Atmospheric moisture budget

moisture convergence + evaporation = precipitation



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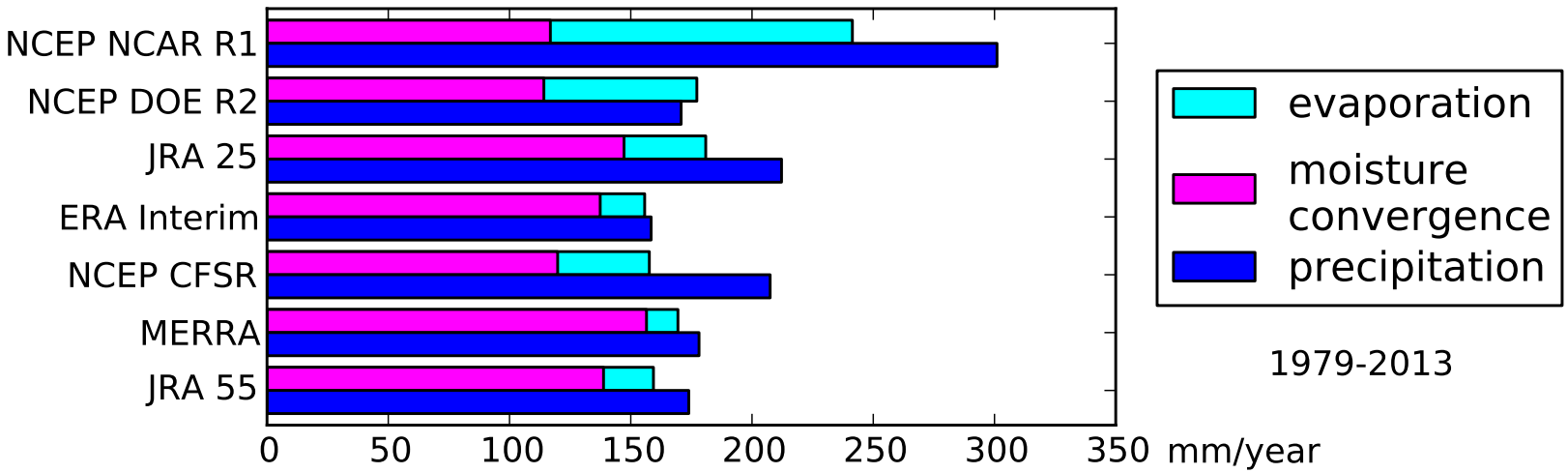
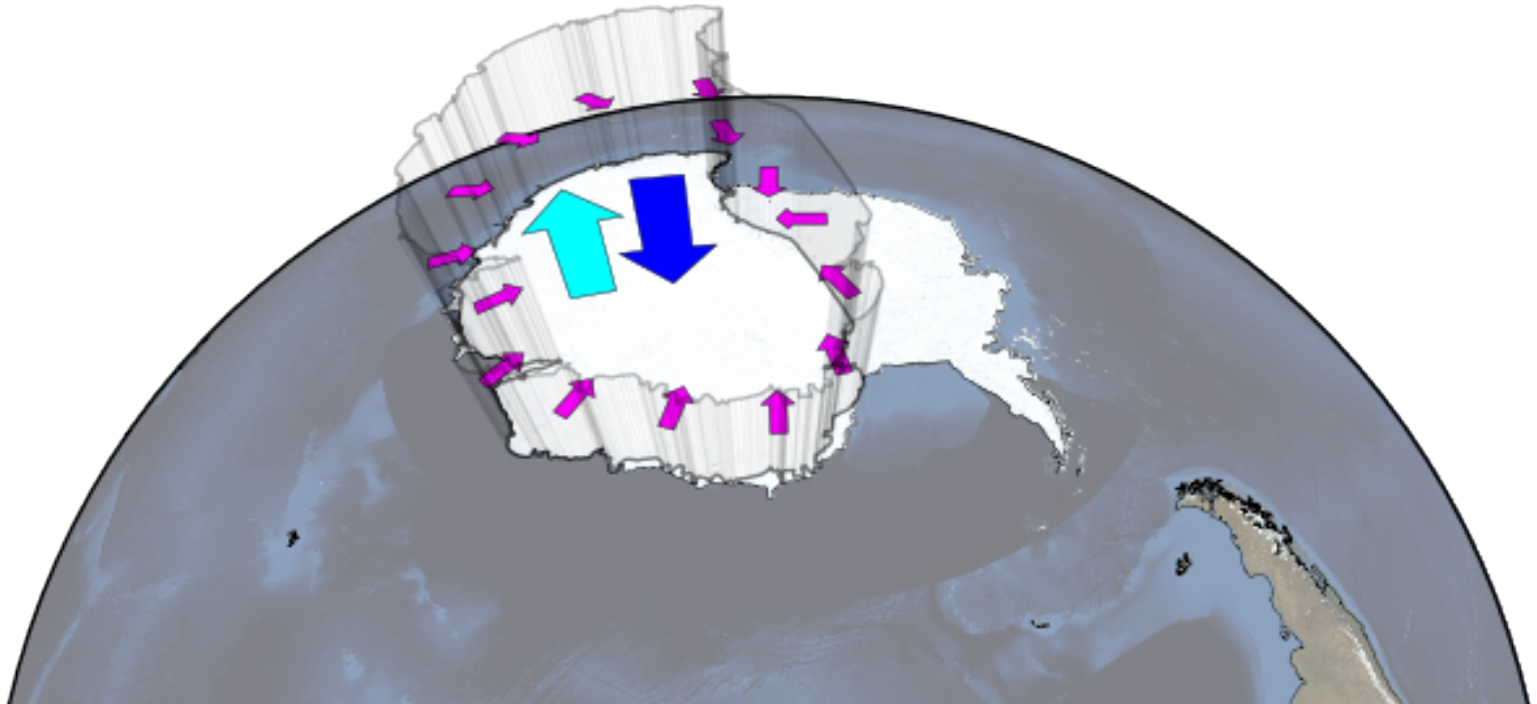
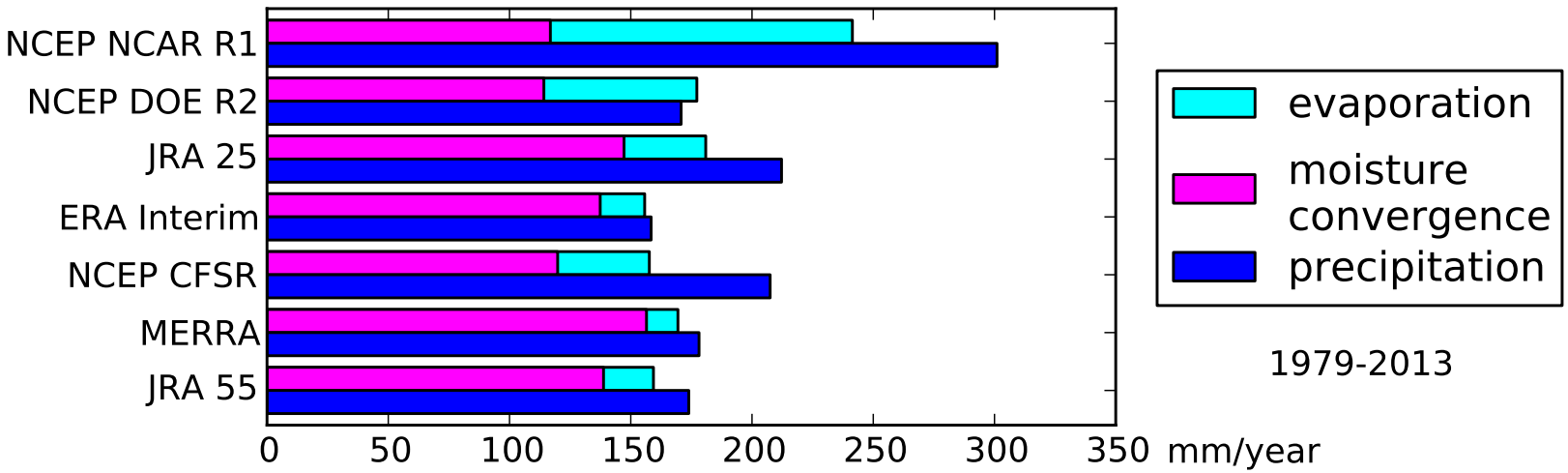


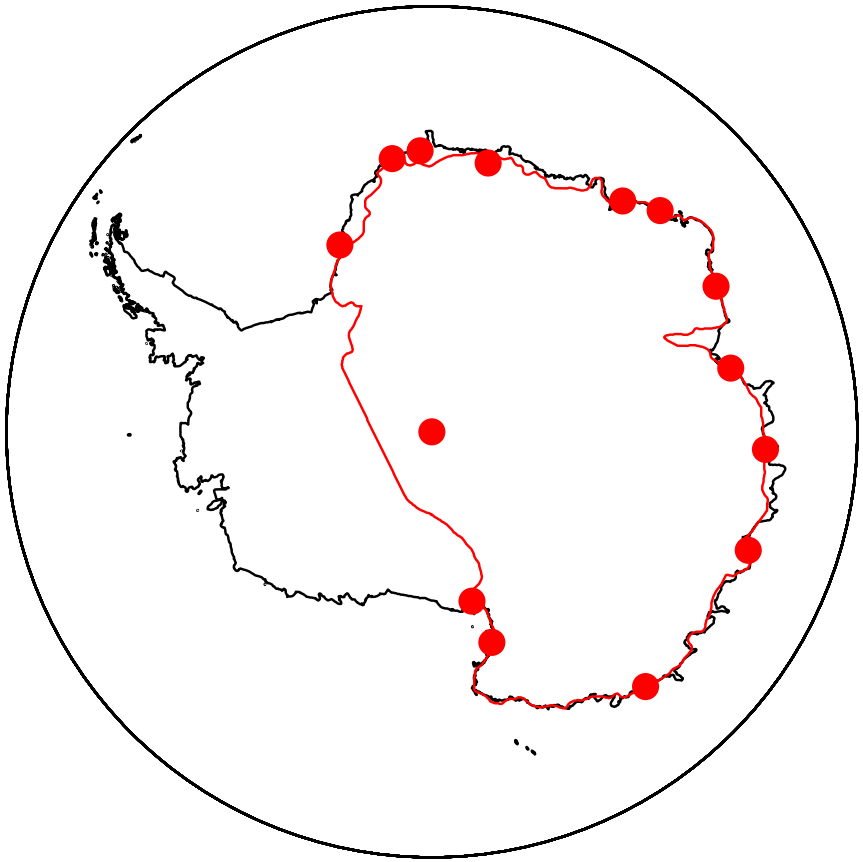



# Problems with reanalyses



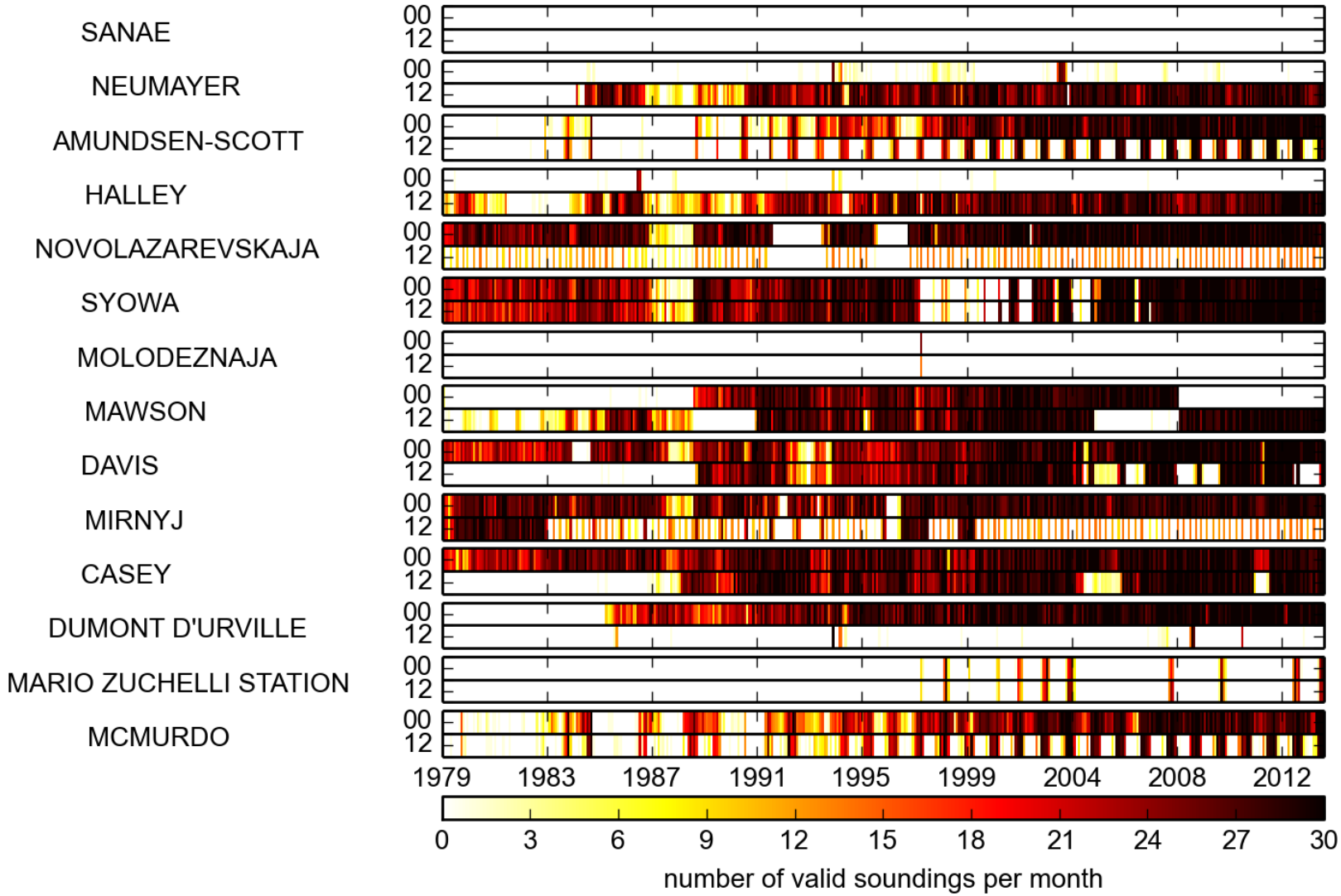

- Non-closure of the moisture budget
- Net precipitation is ambiguous due to model spin-up
- Trends are untrustworthy (Bromwich et al. 2012)
  - Artificial jumps with new satellites
  - Incoherent regional trends
- Even advection (analysed) is incoherent

# Radiosoundings from IGRAv2

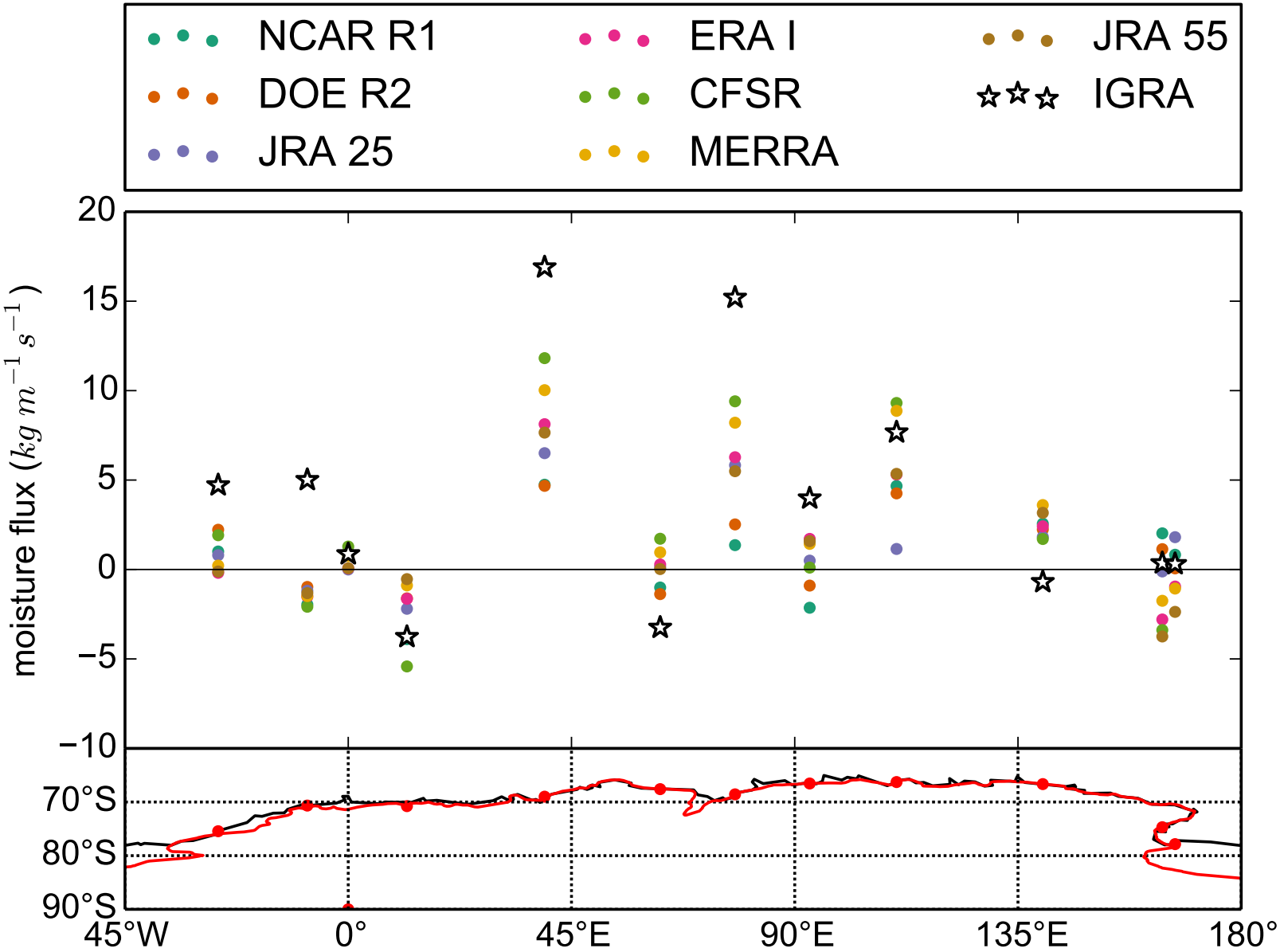



East Antarctic stations with radiosonde programs
($>$ 10 years between 1979 and 2013)

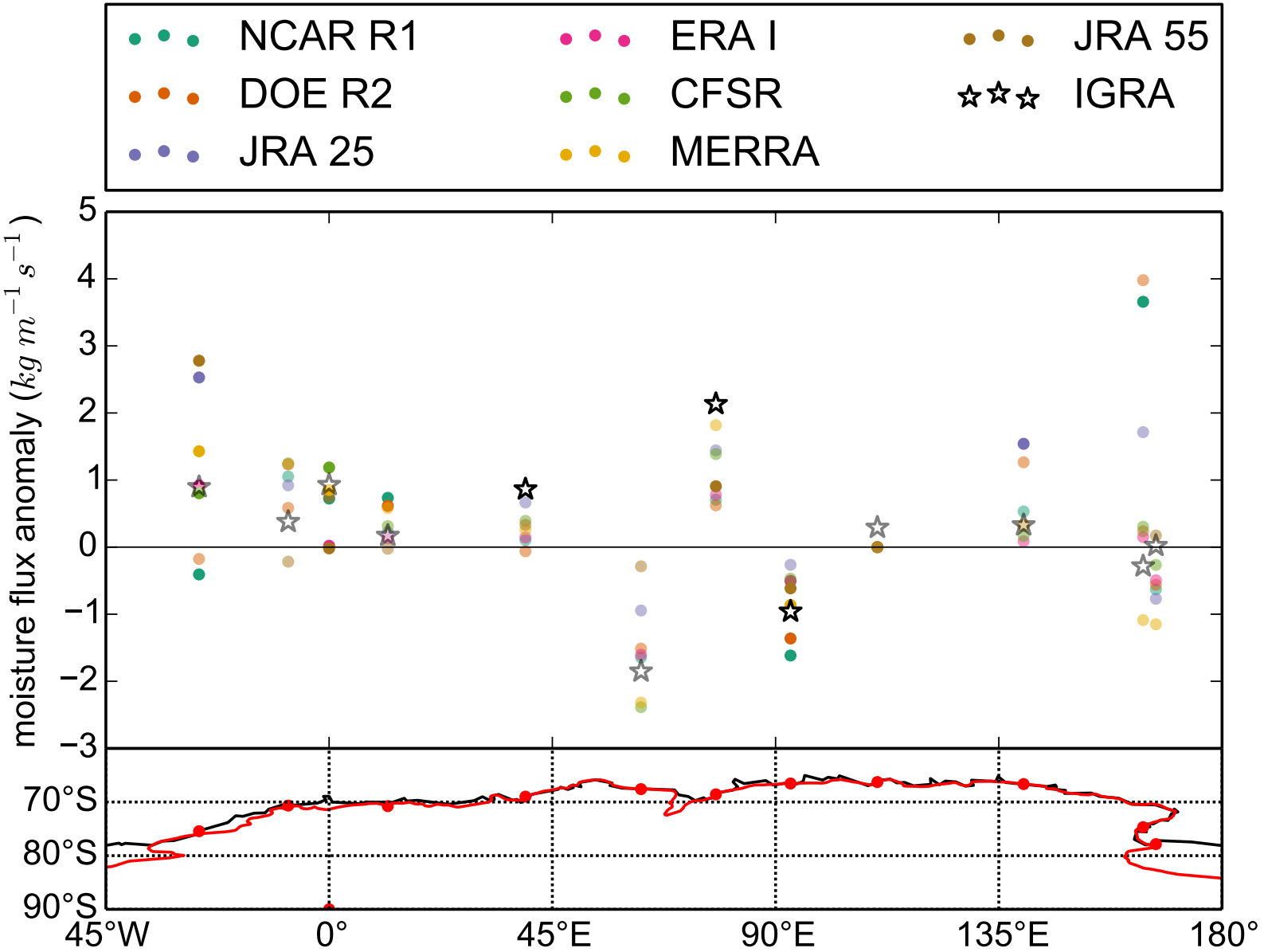
# Number of valid soundings



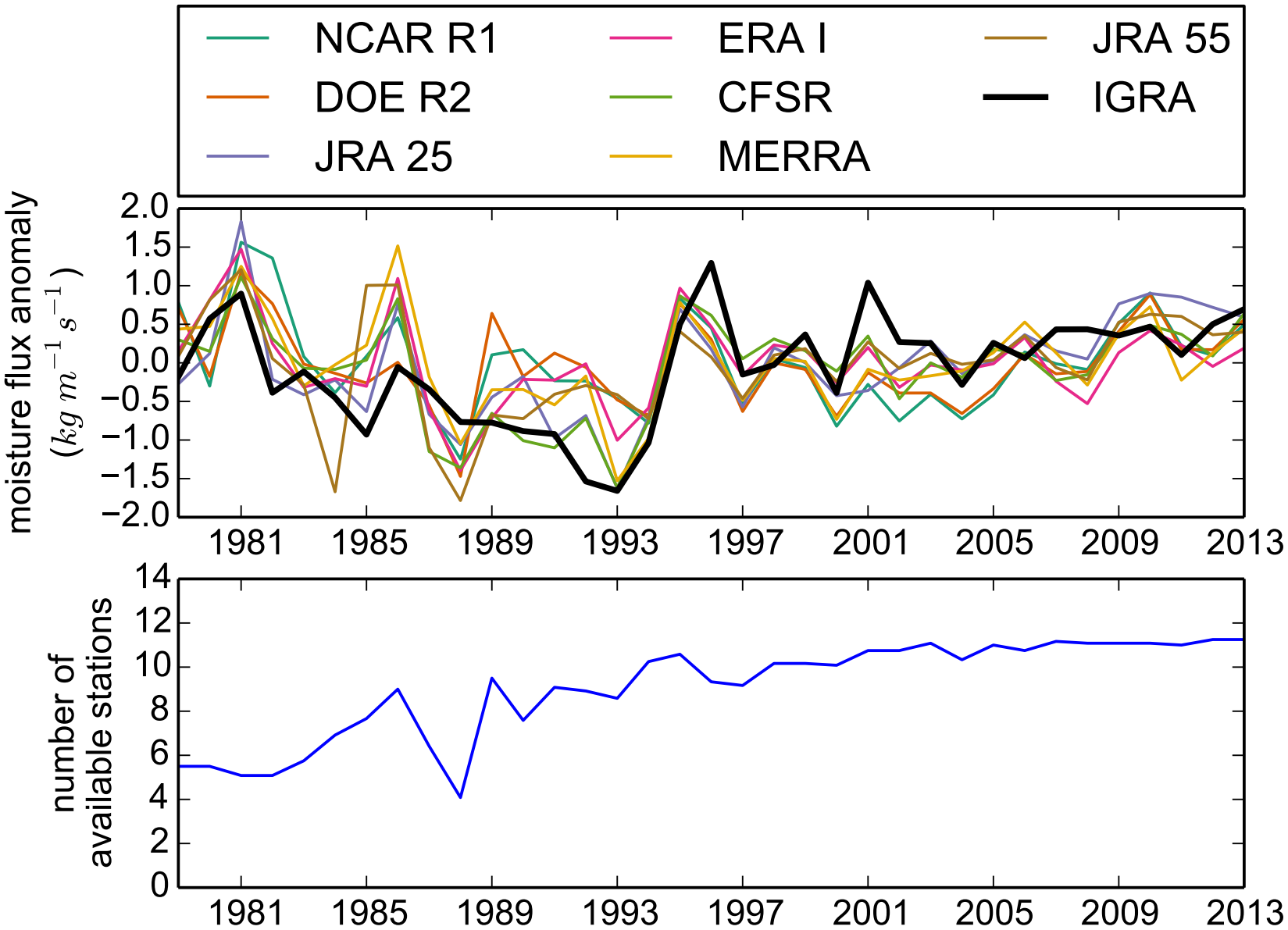
# Moisture fluxes into East Antarctica



# Linear trends of transport anomalies



# Global time series of transport anomalies



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  - net precipitation
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  - moisture advection as a proxy for snow accumulation
  - high temporal resolution (as opposed to e.g. stake farms)
  - the higher the reanalysis resolution, the closer the match
- Moisture advection shows decadal variability but no trends
  - no long term change in humidity either