



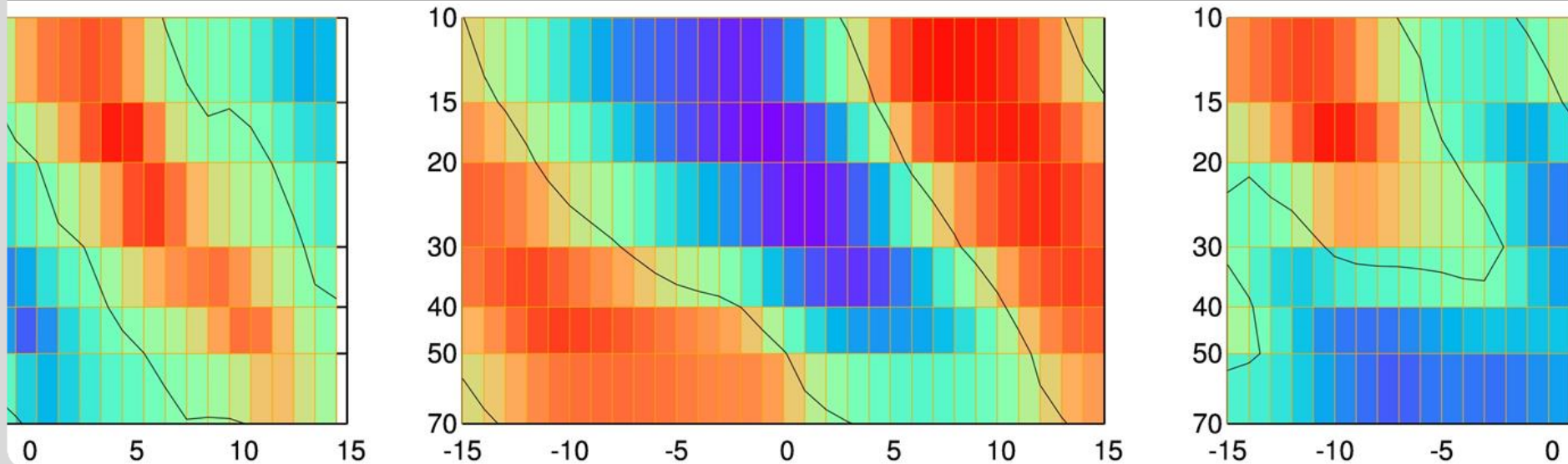
ESA Ozone_CCI Results and Considerations

Climate Research Group:

Martin Dameris (DLR), Michiel van Weele (KNMI) and **Peter Braesicke (KIT)**

Ozone_CCI Science Lead: Michel van Roozendaal (BIRA)

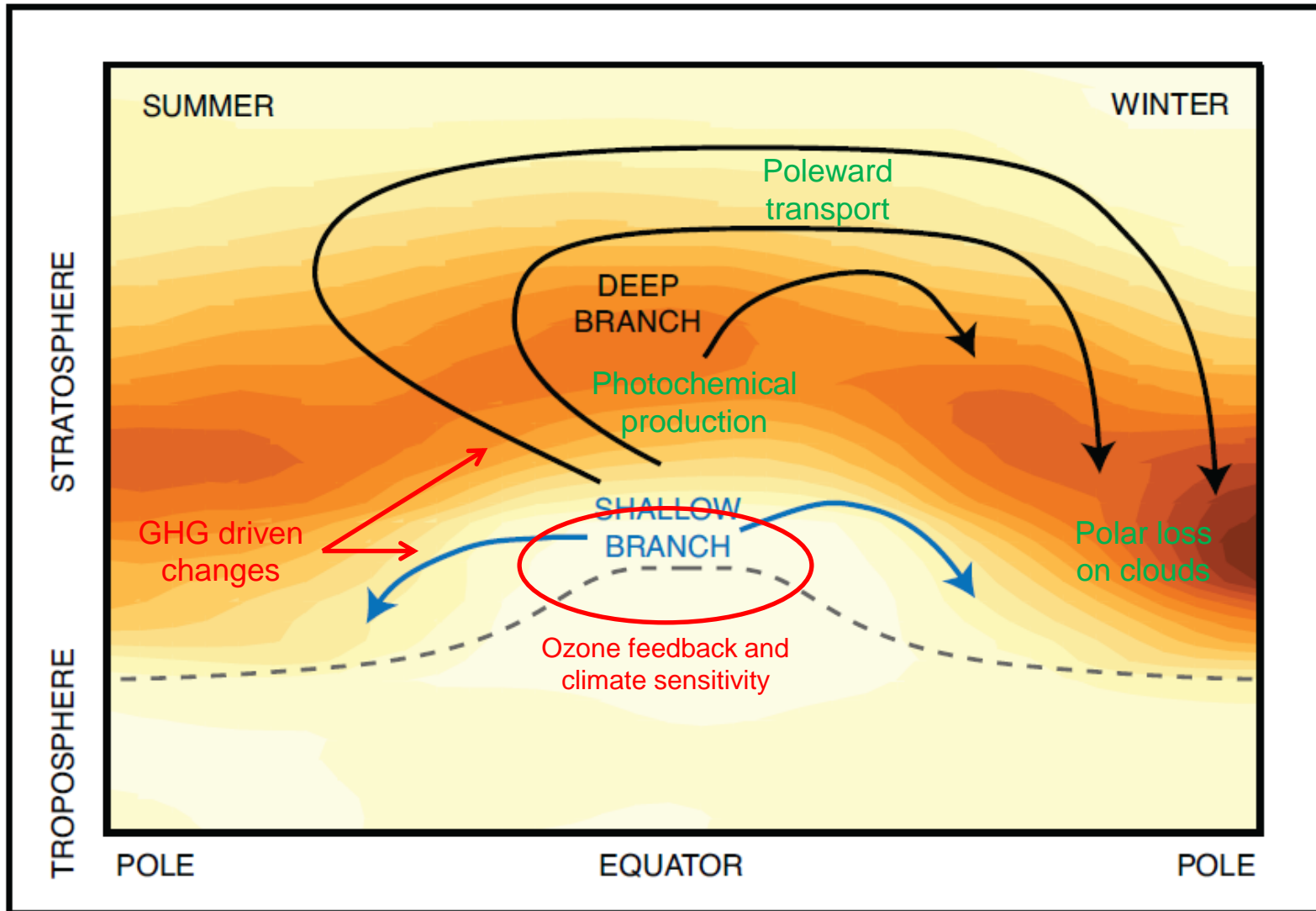
IIMK-ASF



Structure

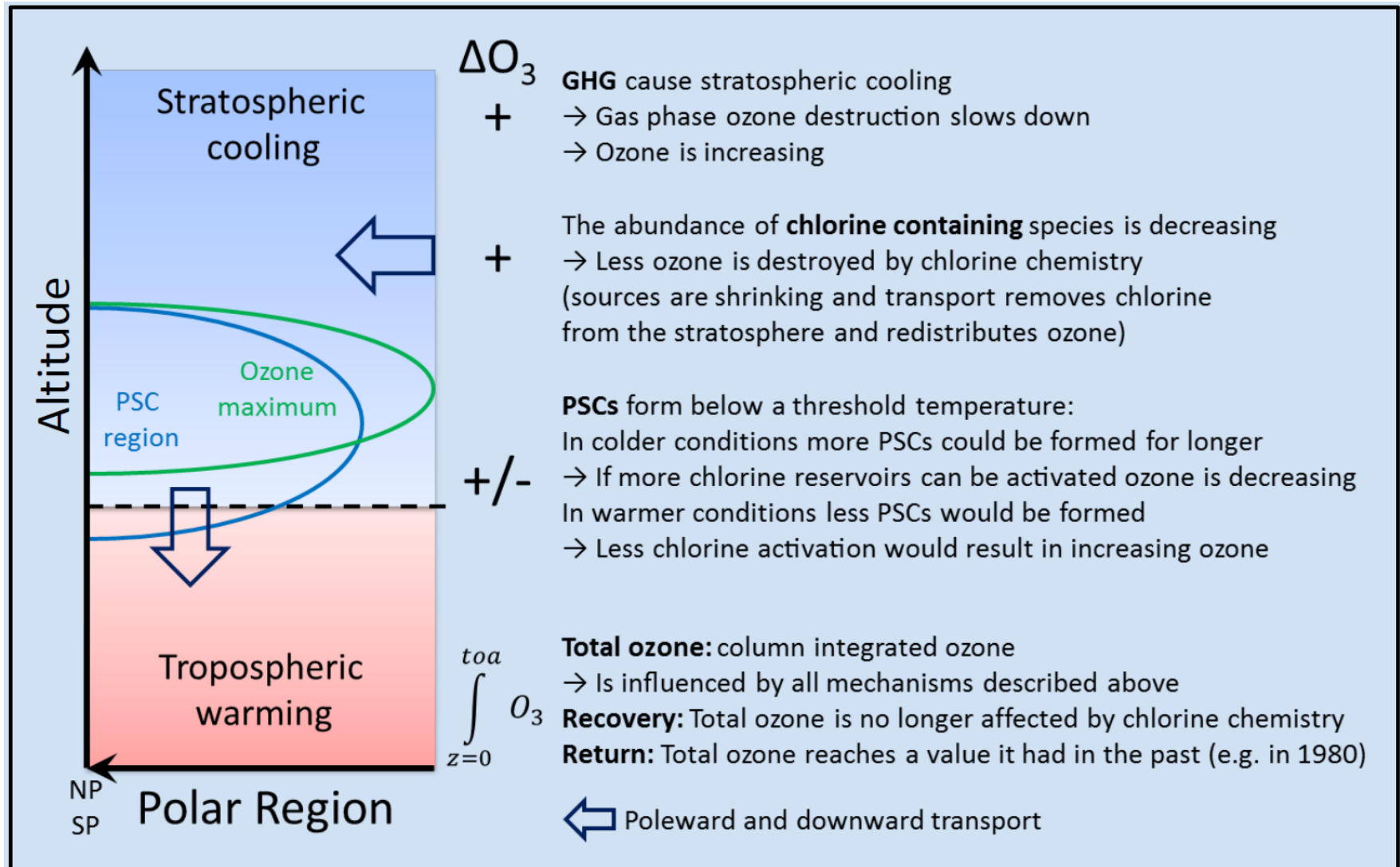
- Ozone in a changing climate
- Monitoring past and projecting future change
- Attributing change
- Column versus profile changes
- Towards the 2018 assessment of the ozone layer ...

Circulation and Ozone



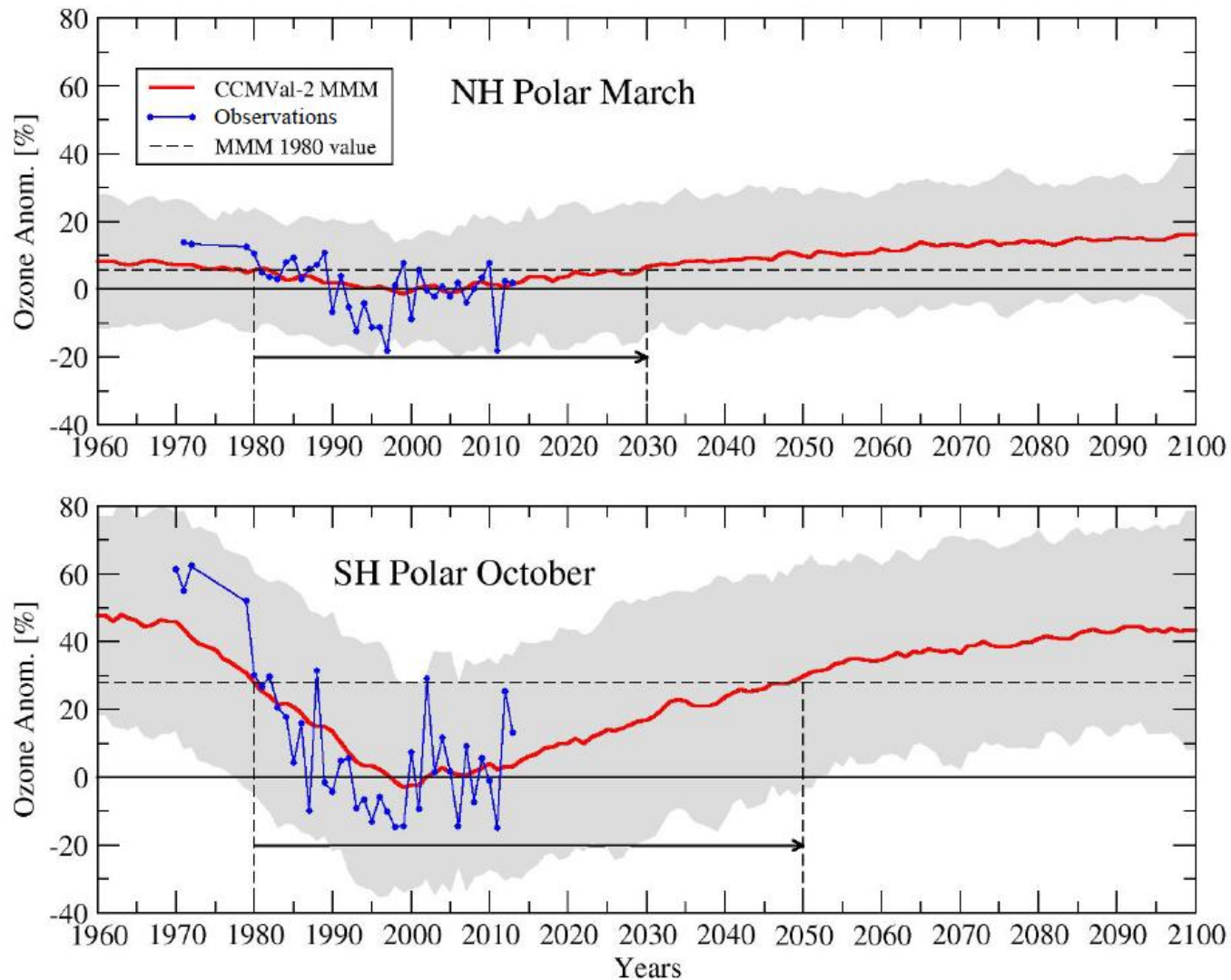
WMO, 2014

Polar Ozone and Climate Change



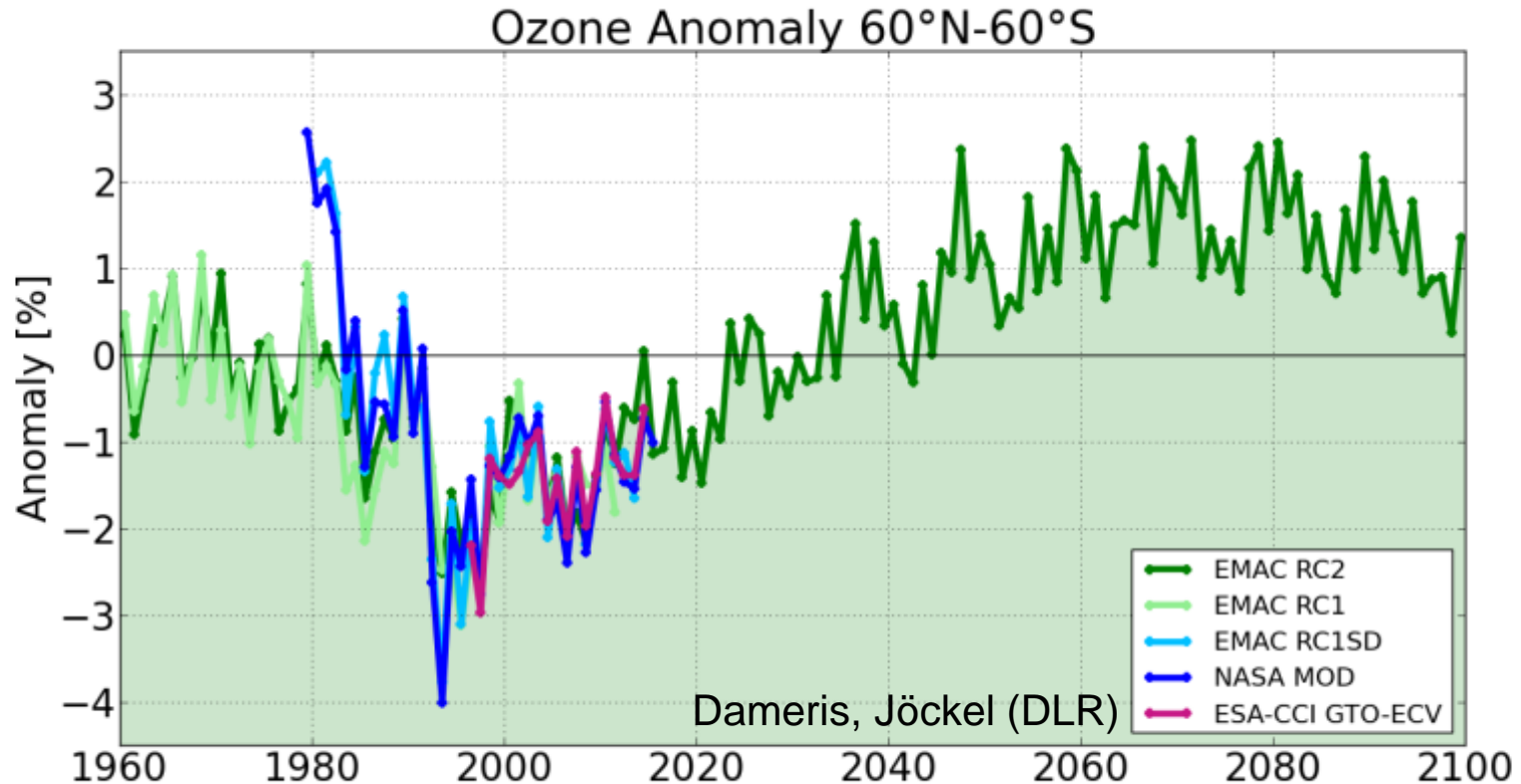
WMO, 2014

Polar Ozone: Past to Future



WMO, 2014

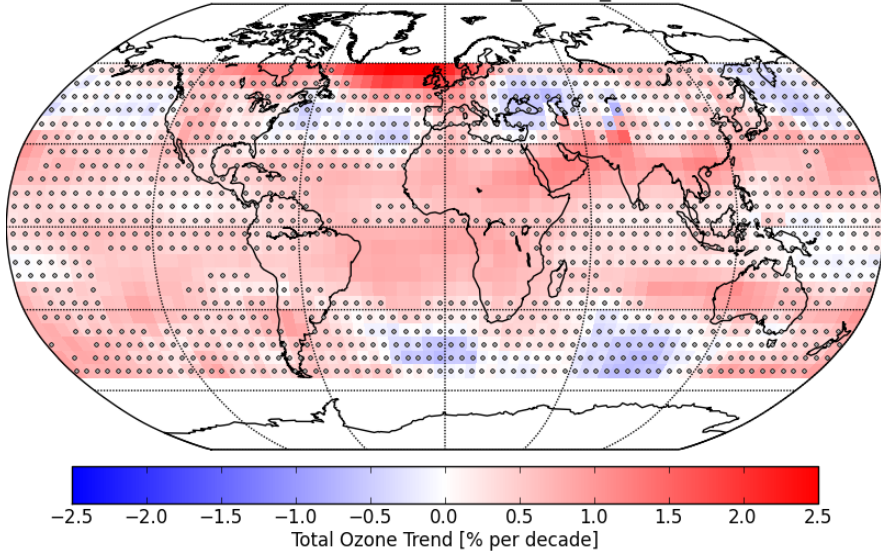
Near Global Anomaly Comparison



Anomalies can be modelled well, but biases still exist, and it is still important to make them smaller.

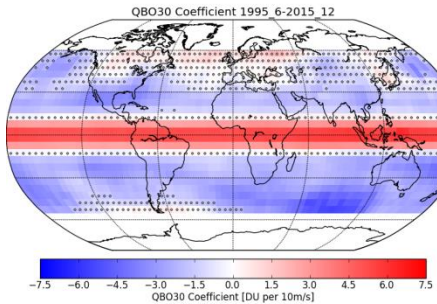
Total Ozone Trends and Variability

Total Ozone Trend 1995-6-2015-12

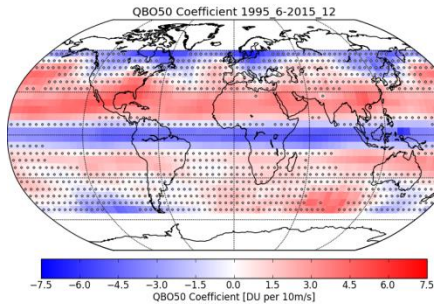


- $O_3(m) = A + B \cdot m + C \cdot SF(m) + D \cdot QBO30 + E \cdot QBO50(m) + F \cdot MEI(m) + X(m)$
- Update of Coldewey-Egbers et al., GRL, 2014
- Linear trend is not significant in the middle latitudes due to strong natural variability that masks expected ozone recovery
- Solar cycle, QBO, and **ENSO** impact ozone in the tropics

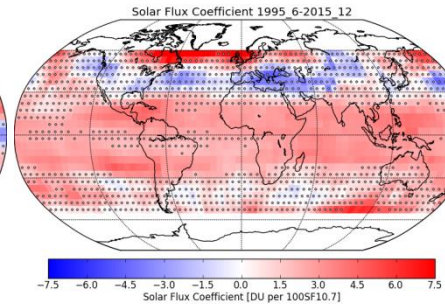
QBO30



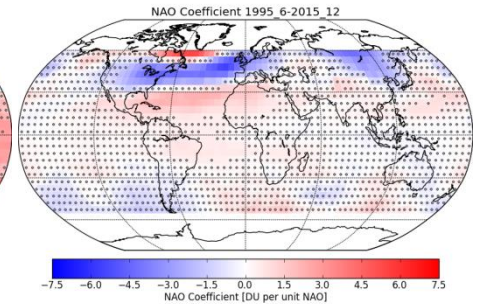
QBO50



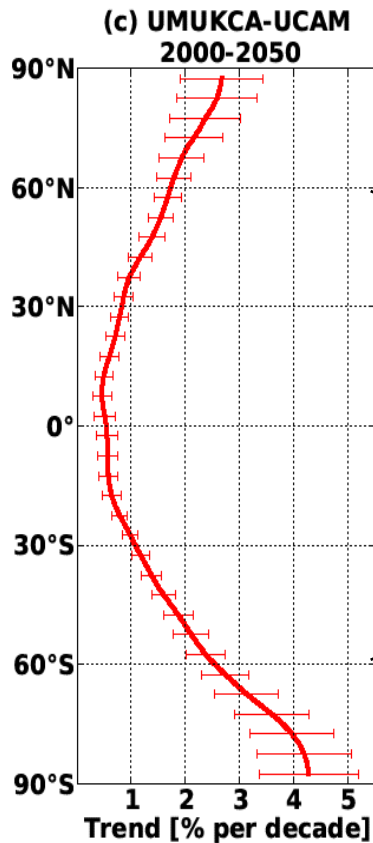
SolarCycle



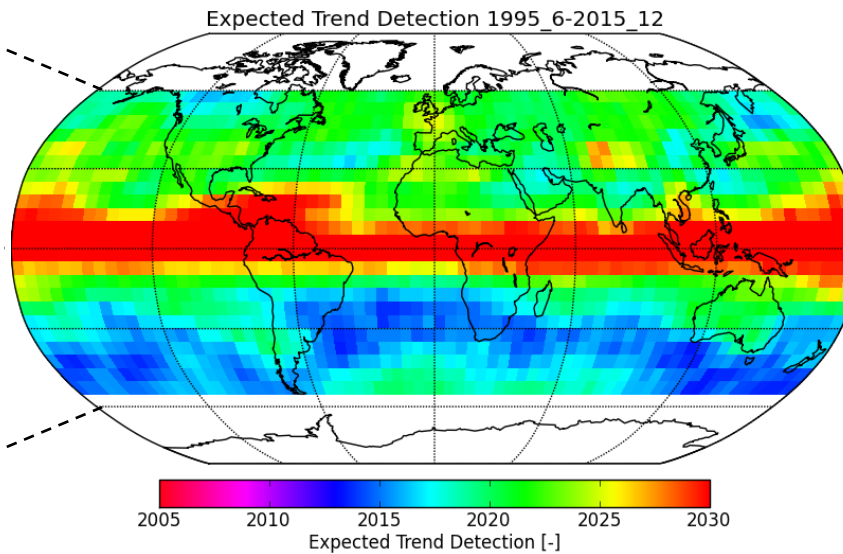
NAO - Index



Expected Trend Detection



Weatherhead et al., JGR, 2000:
Number of years $\rightarrow n^* \sim (\sigma / |B|)^{2/3}$



Additional 5-10 years of observations are required



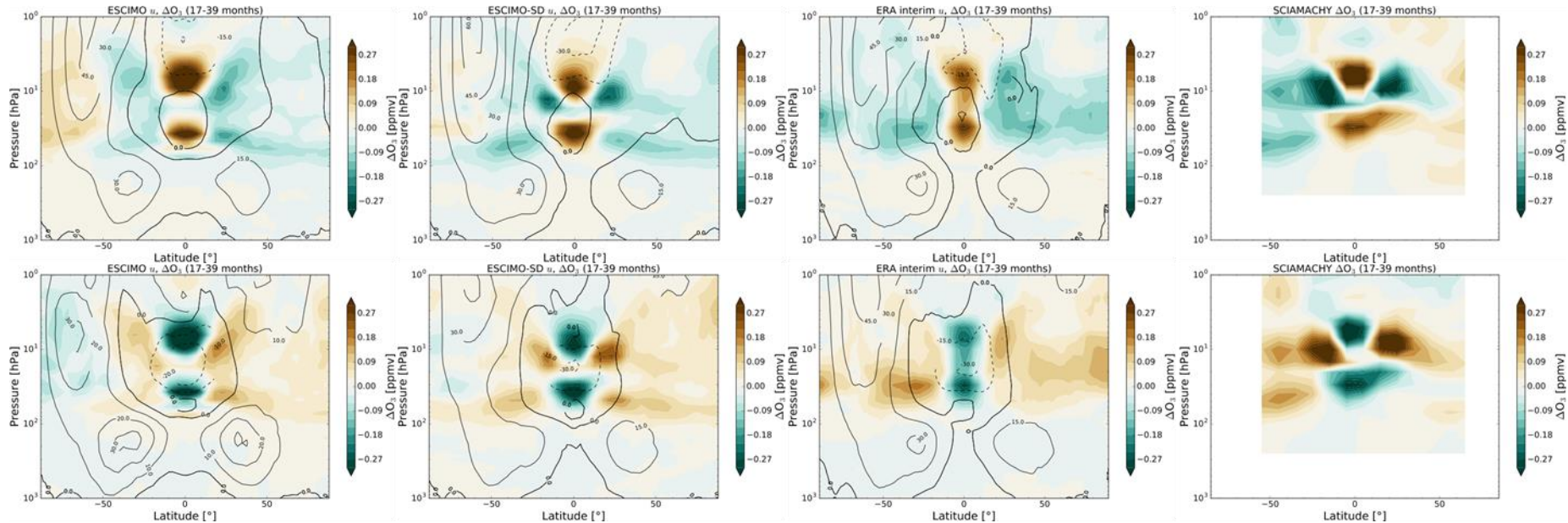
Vertical QBO Structure

ESCiMo

ESCiMo SD

ERA interim

O3CCI



without nudging

with nudging

reanalysis

satellite

Defined by column ozone QBO: Maximum (top), Minimum (bottom)

Kerzenmacher et al., in preparation

World Meteorological Organization
Global Ozone Research and Monitoring Project—Report No. 52

SCIENTIFIC ASSESSMENT OF OZONE DEPLETION: 2010



National Oceanic and Atmospheric Administration
National Aeronautics and Space Administration
United Nations Environment Programme
World Meteorological Organization
European Commission

World Meteorological Organization
Global Ozone Research and Monitoring Project—Report No. 55

SCIENTIFIC ASSESSMENT OF OZONE DEPLETION: 2014



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United Nations Environment Programme
World Meteorological Organization
European Commission

**“LAUDATO SI’, mi’ Signore”
“Praise be to you, my Lord”**

Climate as a common good

23. The climate is a **common good**, belonging to all and meant for all. At the global level, it is a **complex system** linked to many of the essential conditions for human life. A very solid scientific consensus indicates that we are presently witnessing a disturbing warming of the climatic system.

