What controls the inter-annual variability of Arctic ozone?

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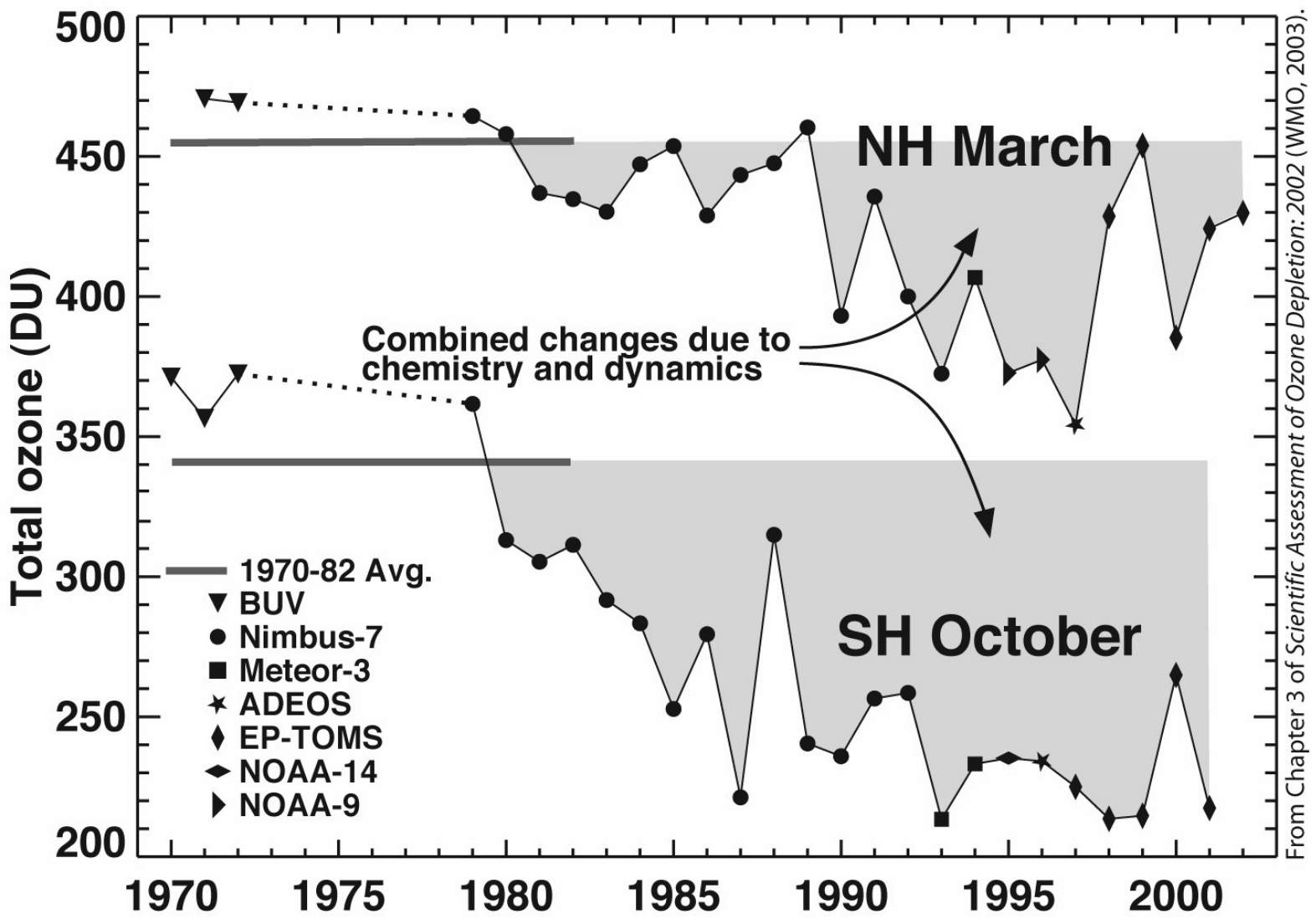
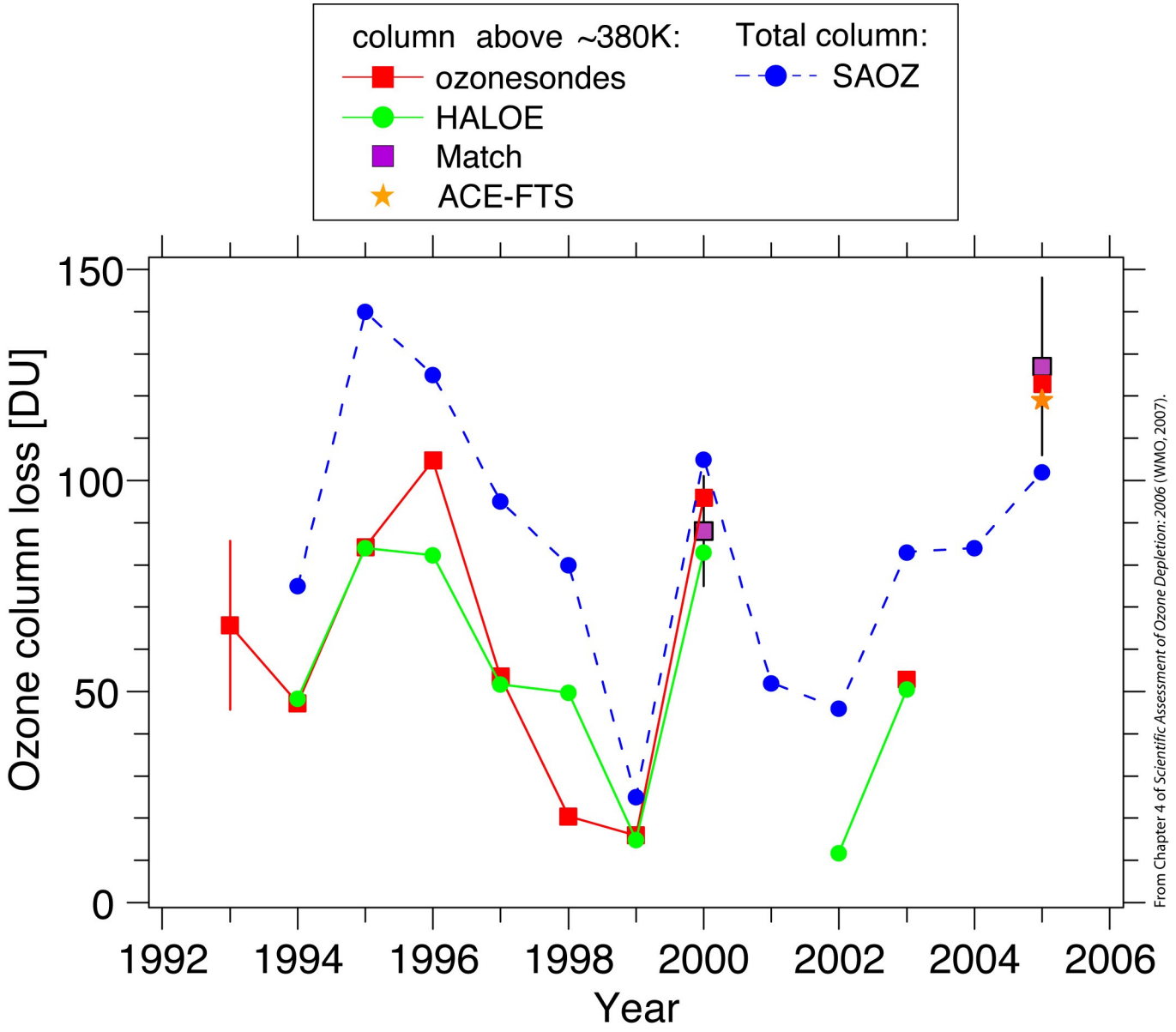
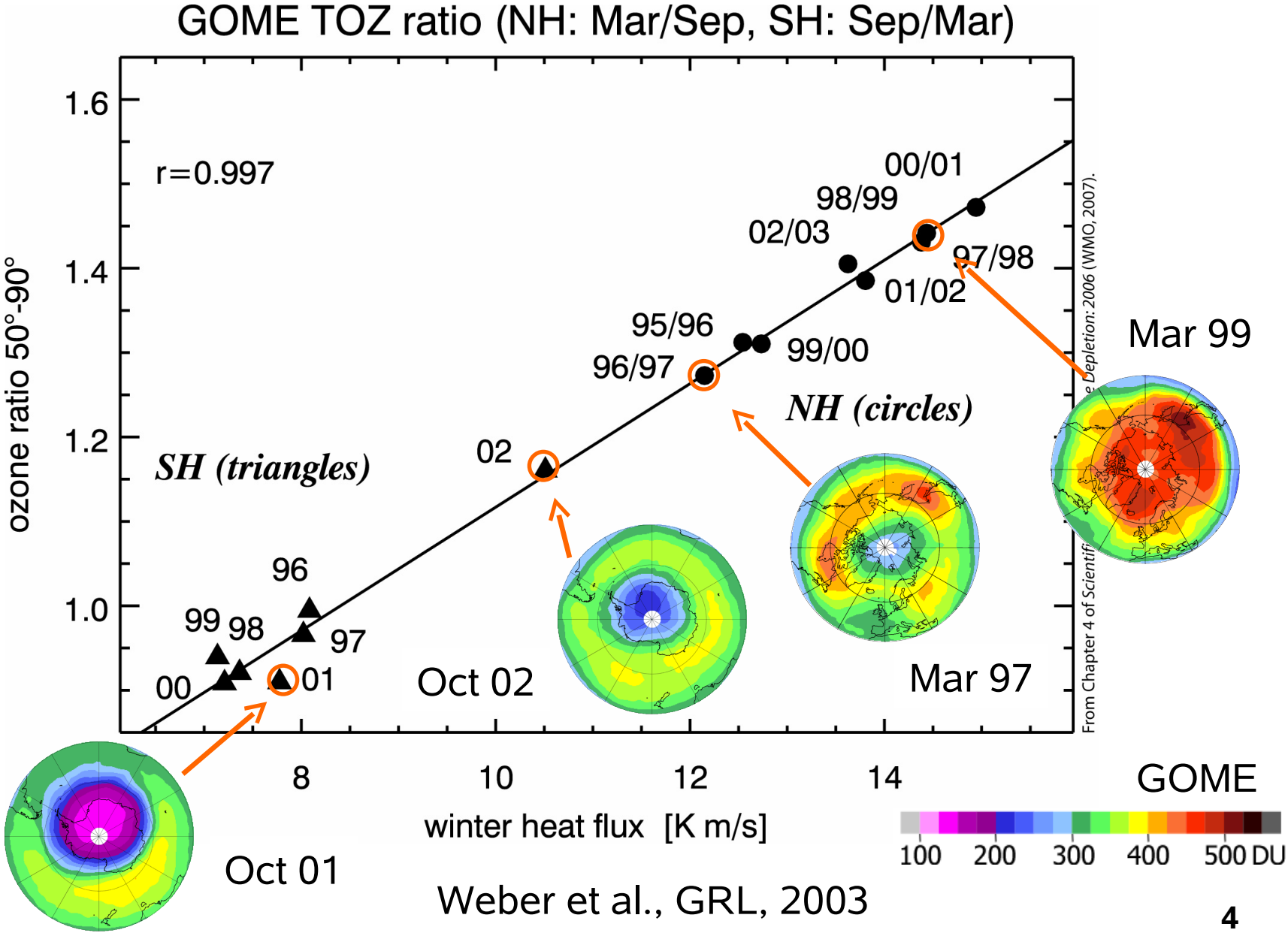
Introduction: Inter-annual variability in polar ozone



Introduction: Vortex-averaged chemical ozone loss

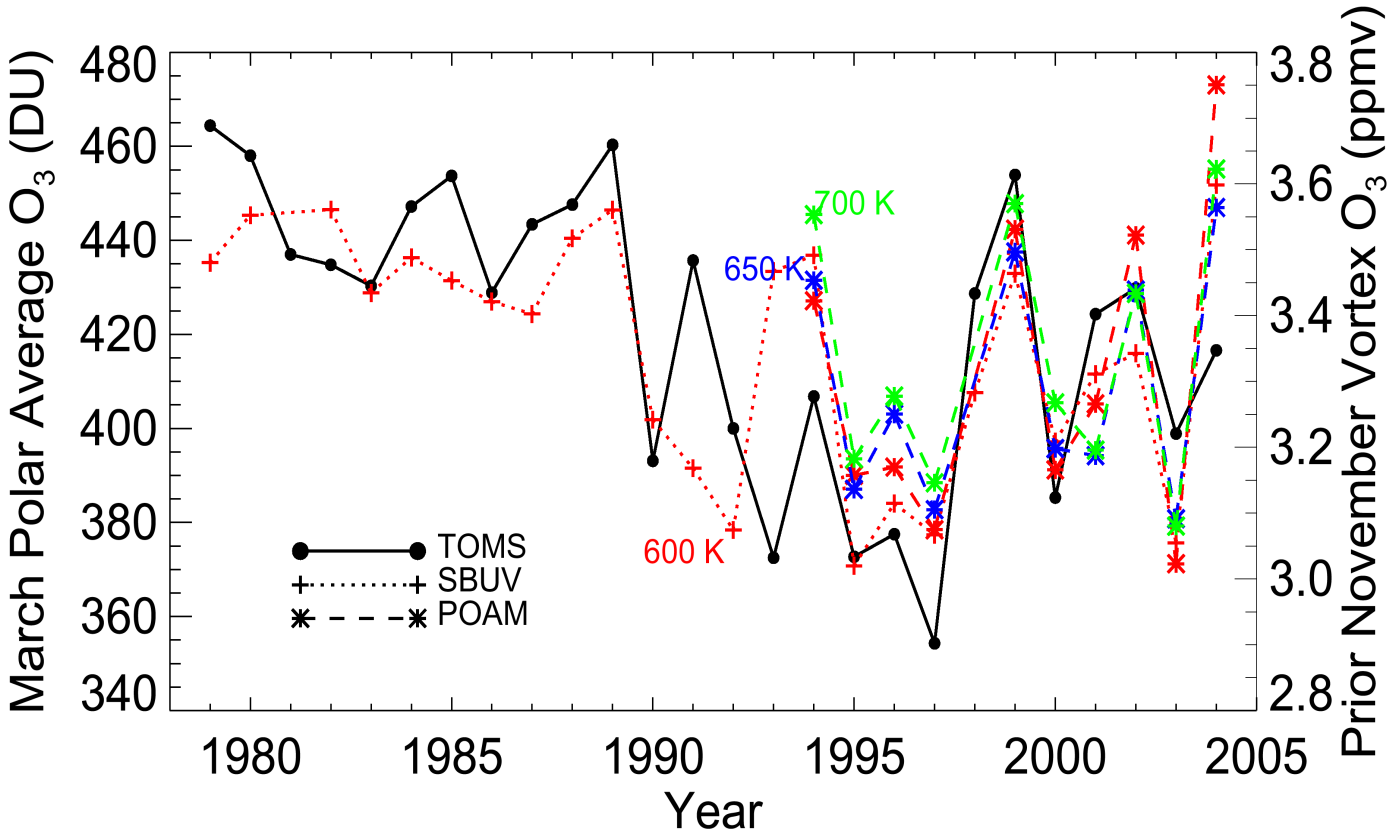


Dynamical influence on total ozone



Weber et al., GRL, 2003

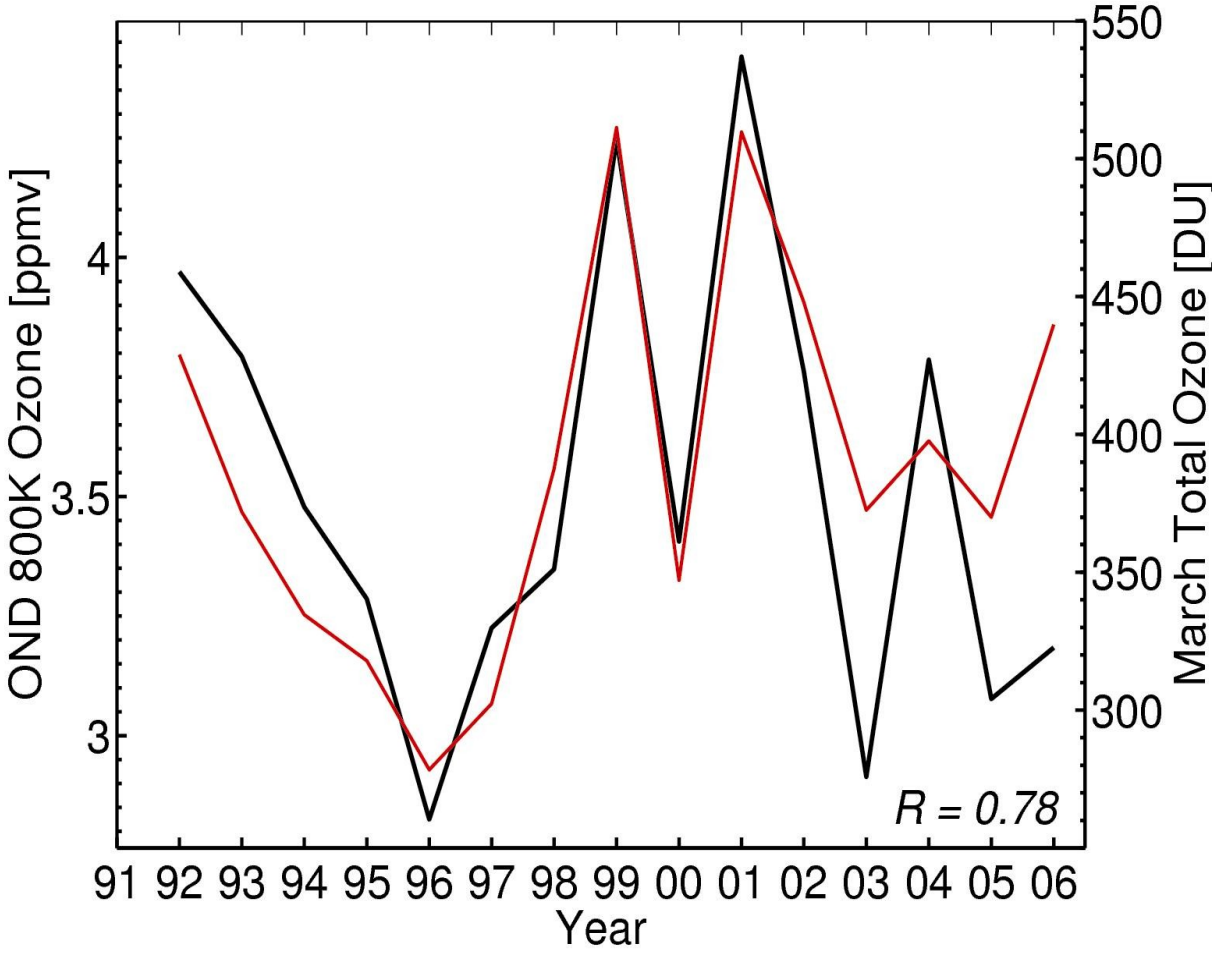
March total ozone and November vortex ozone



Ozone in prior November is correlated with total ozone in March!

Kawa et al., ACP, 2005

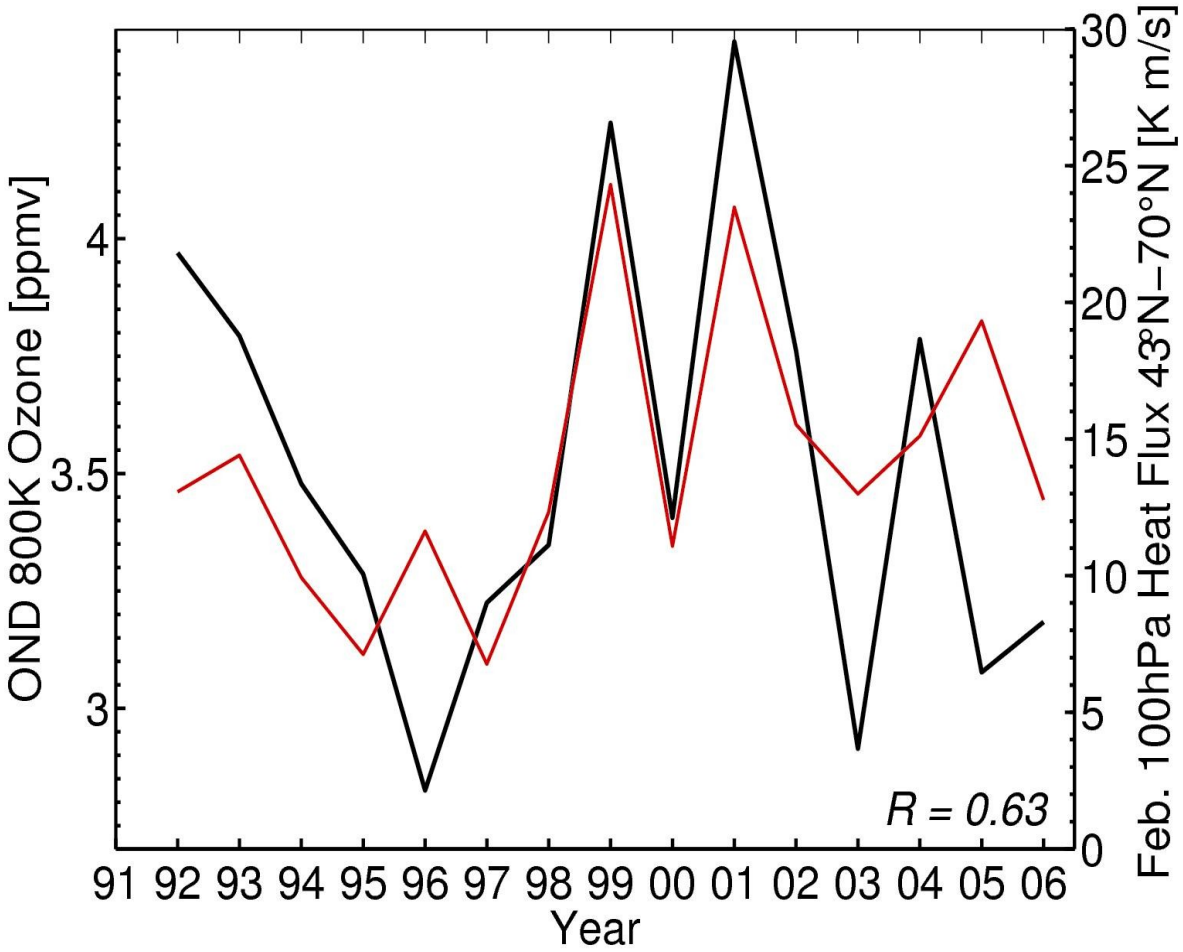
Ozone sonde observations at Ny-Ålesund



Ozone in November is correlated with March total ozone.

Sinnhuber et al., ACP, 2006

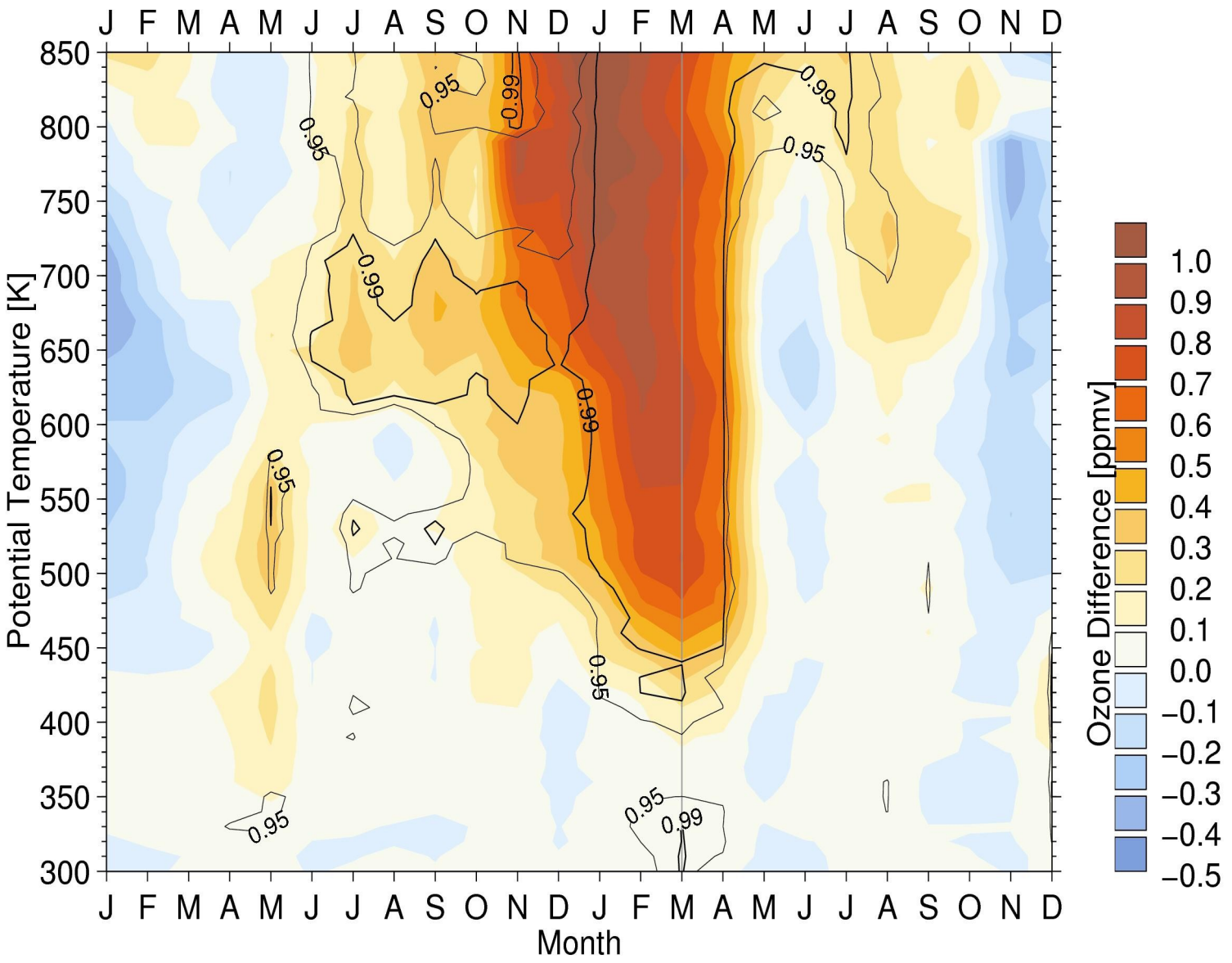
Ozone sonde observations at Ny-Ålesund



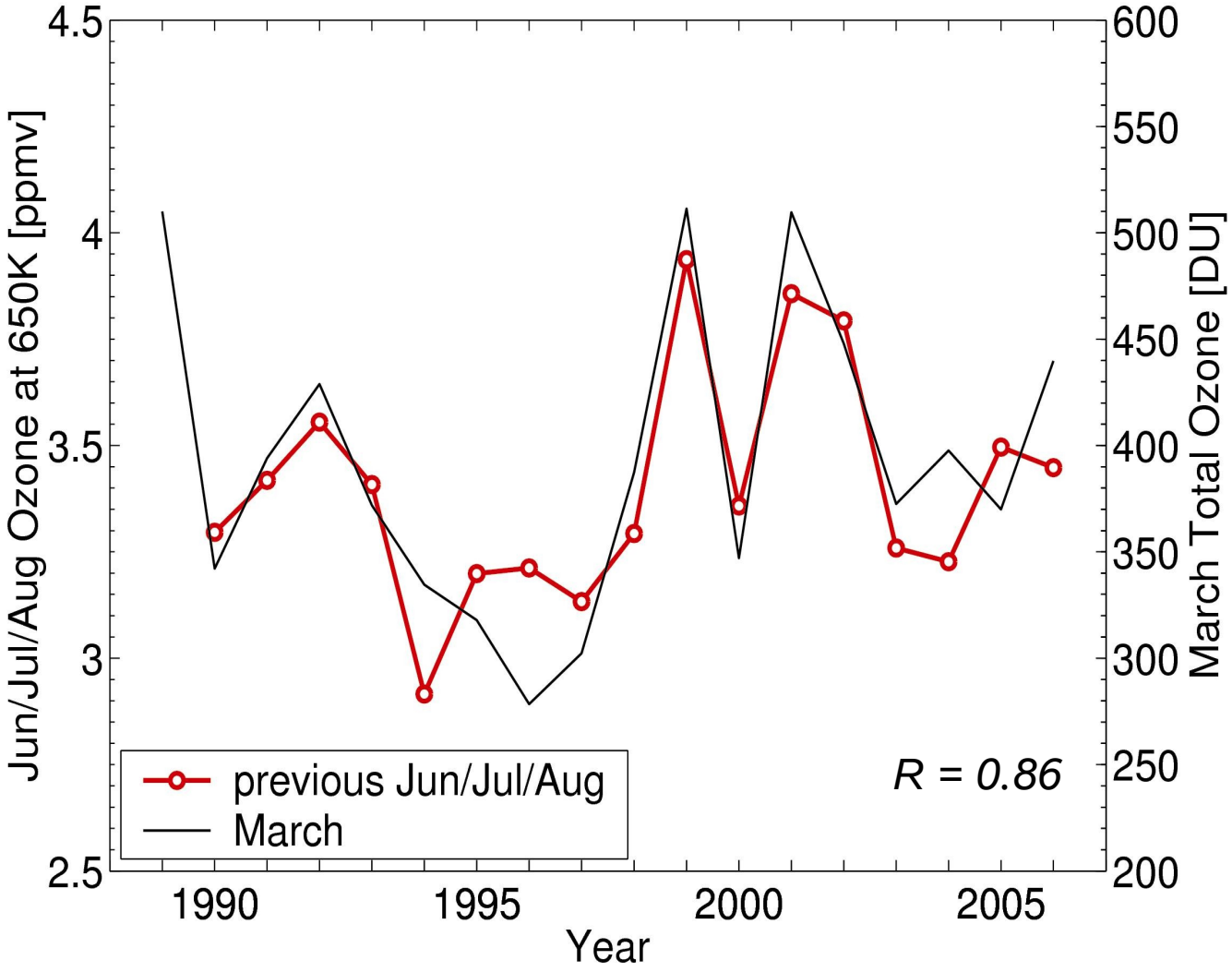
Ozone in November predicts 100 hPa EP flux during February!

Sinnhuber et al., ACP, 2006

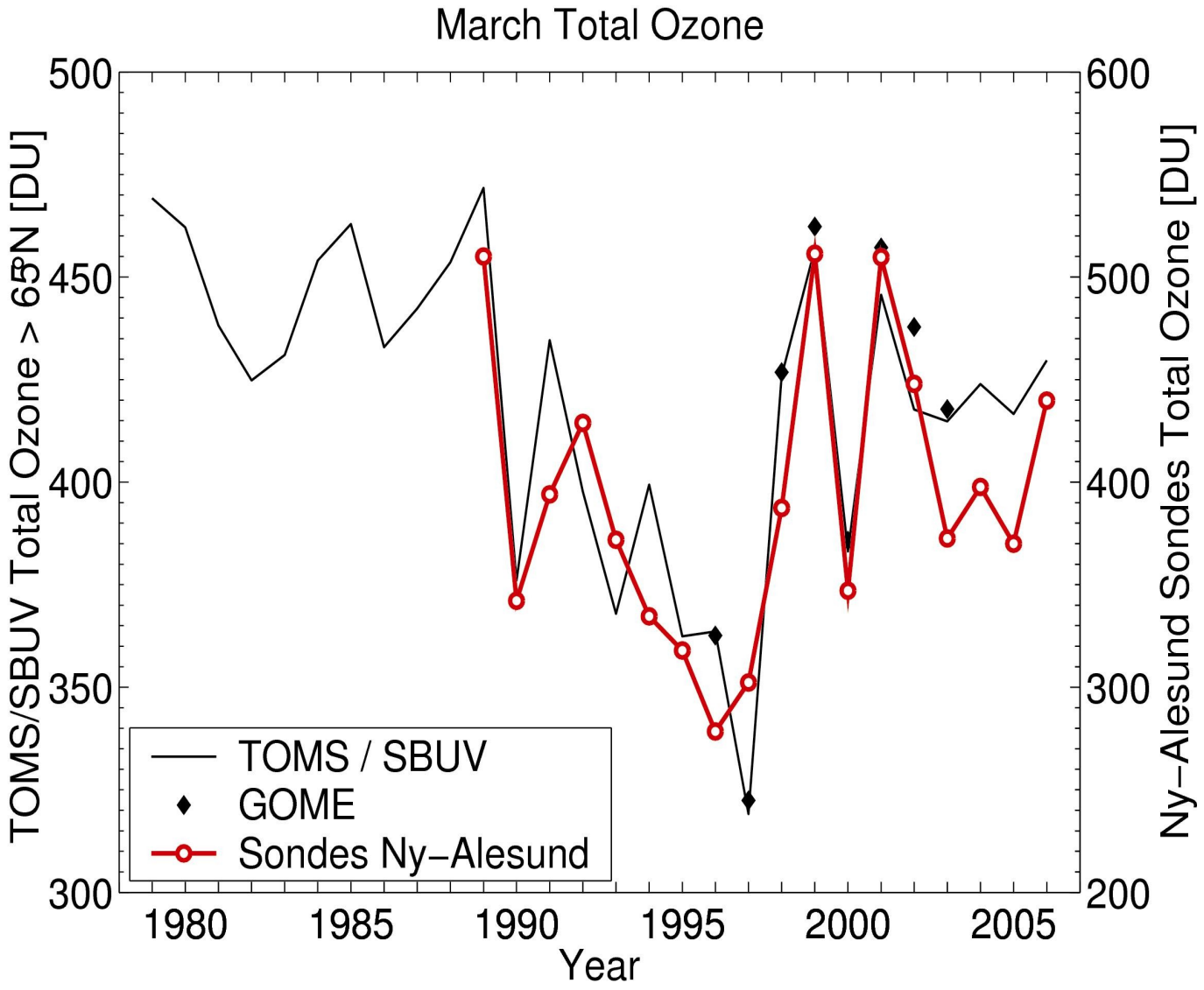
Development of ozone anomalies



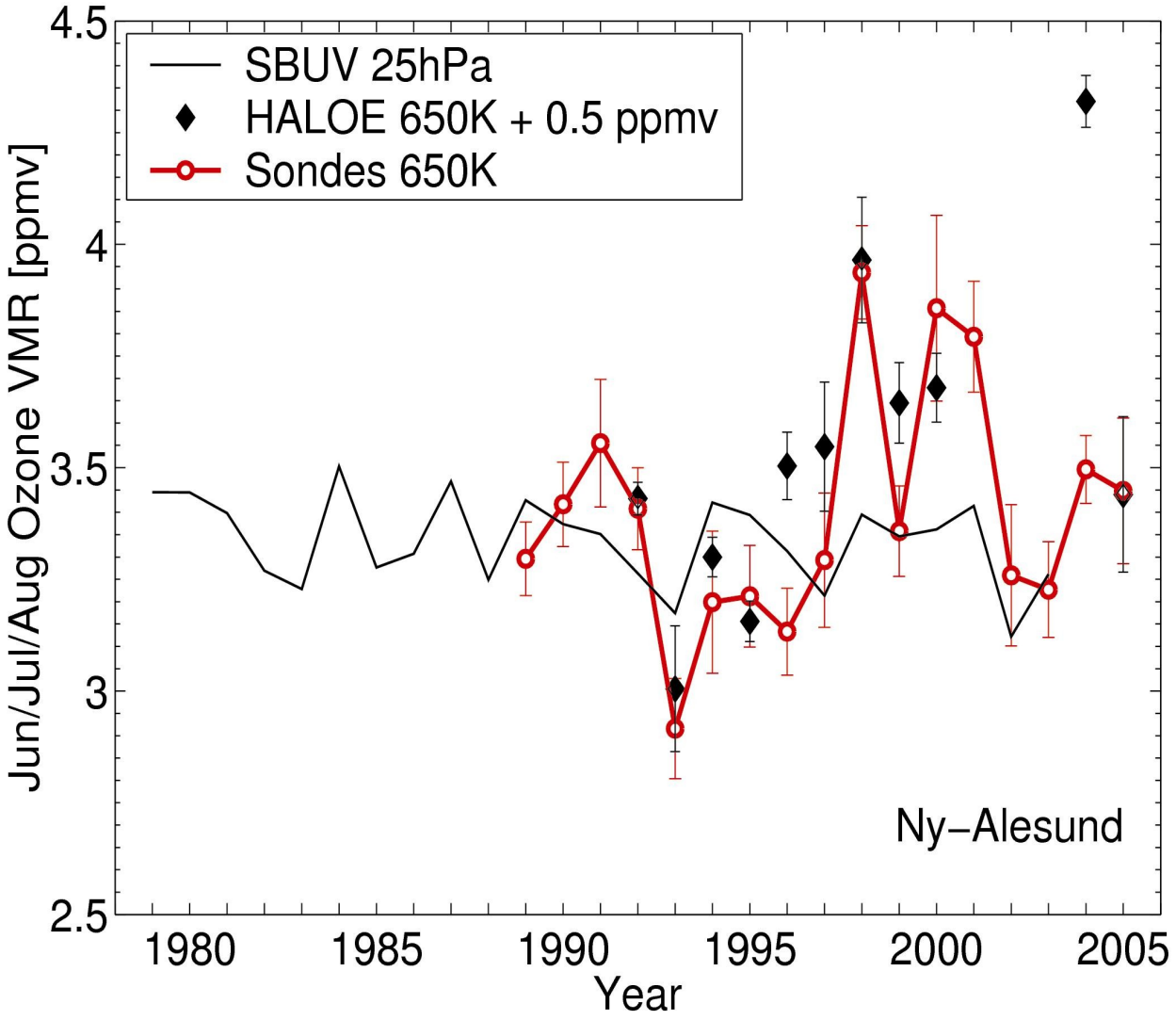
Correlation with summertime ozone: Ny-Ålesund



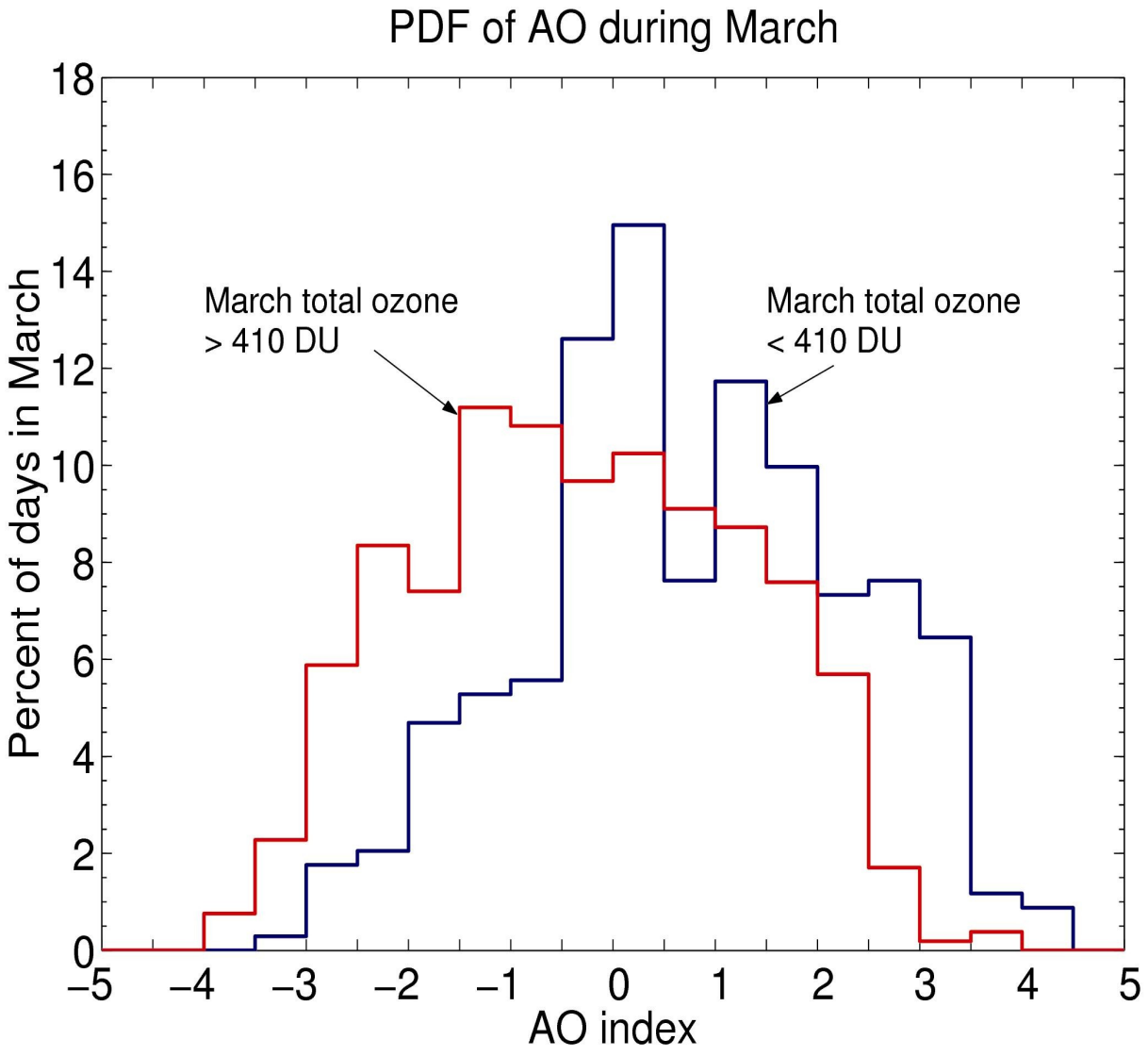
Ozone sondes: Comparison with other data – March total ozone



Ozone sondes: Comparison with other data – summer ozone

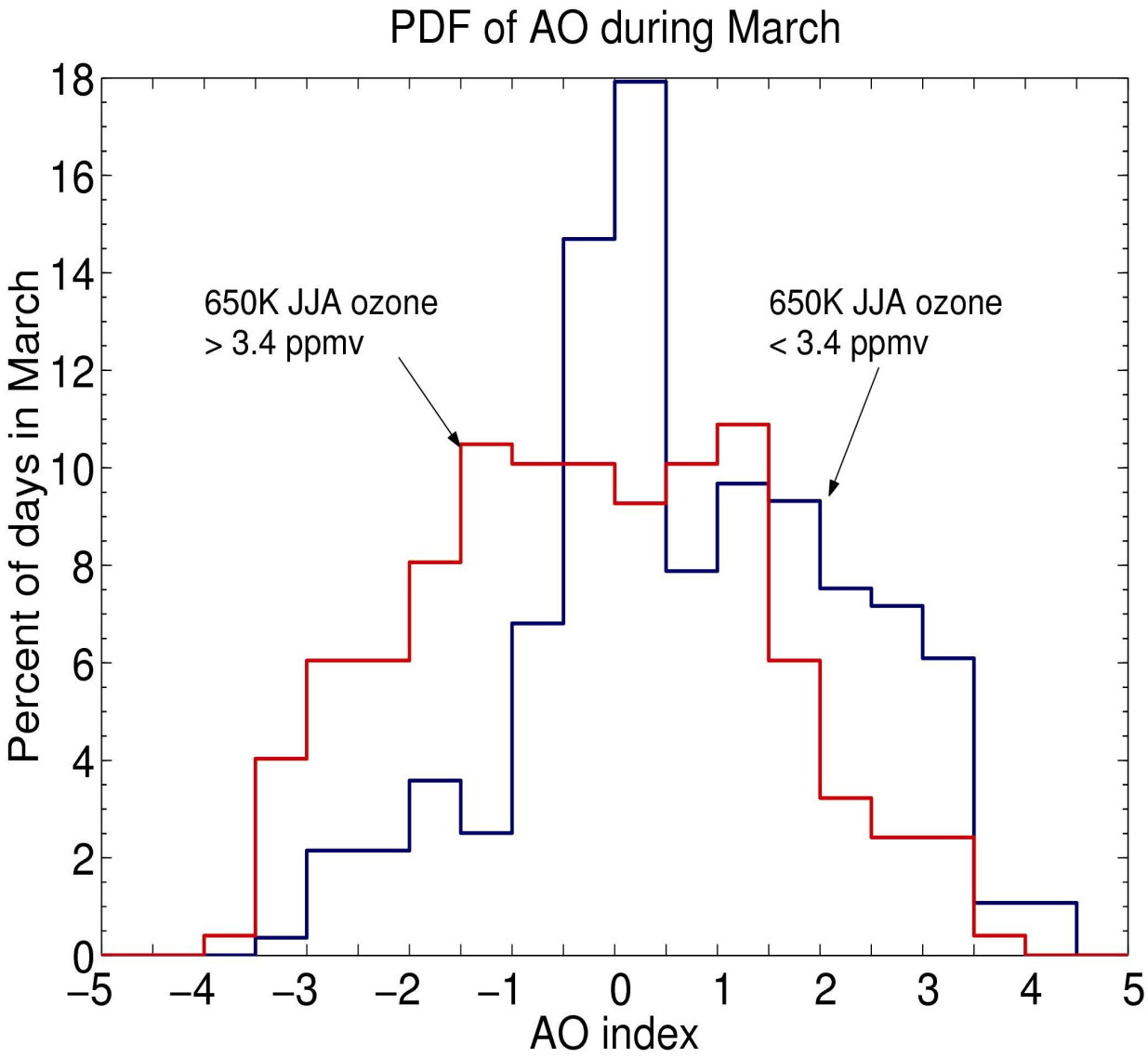


Impact on surface weather and climate?



Arctic oscillation at the surface and total ozone during March

Can ozone during summer predict the Arctic Oscillation?



Arctic oscillation during March and ozone during previous summer

Summary and Conclusions

- Arctic total ozone in March is correlated with anomalies in stratospheric ozone several month before. Moreover, the mid-winter EP flux is apparently correlated with summer to autumn ozone anomalies.
- Years with high ozone during summer are typically associated with high total ozone during the following March and a higher probability of finding the Arctic Oscillation in its low phase, and vice versa.
- The link between stratospheric ozone during summer and autumn and atmospheric dynamics during winter and total ozone during March is not clear at present. This unexpected finding raises the question of what controls the stratospheric inter-annual variability during winter.
- The observed correlation may offer a perspective to predict total ozone and stratospheric dynamics several month in advance.