

Stratospheric Chemistry and ACCESS

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Background

- Studies have shown impact of ozone depletion and recovery on large-scale SH circulation and temperature
(i.e. Perlwitz et al (2008), Son et al (2008), Miller et al. (2006), Arblaster and Meehl (2006))
- Several studies have looked at the impact of variations in SAM on Australian climate
(i.e. Hendon et al (2007), Cai et al (2003, 2005, 2006), Frederiksen and Frederiksen (2007))
- But direct examination of impact of O3 depletion/recovery on SH climate (i.e. rainfall) is yet to be done (perhaps because we don't trust the models enough...)

Goal

- To develop the capacity to model global stratospheric ozone chemistry
 - Interactions between GHG driven climate change and ozone
 - Ozone predictions for SH for UV forecasts
 - Interactions between O₃ and SH circulation and resulting impacts on SH climate

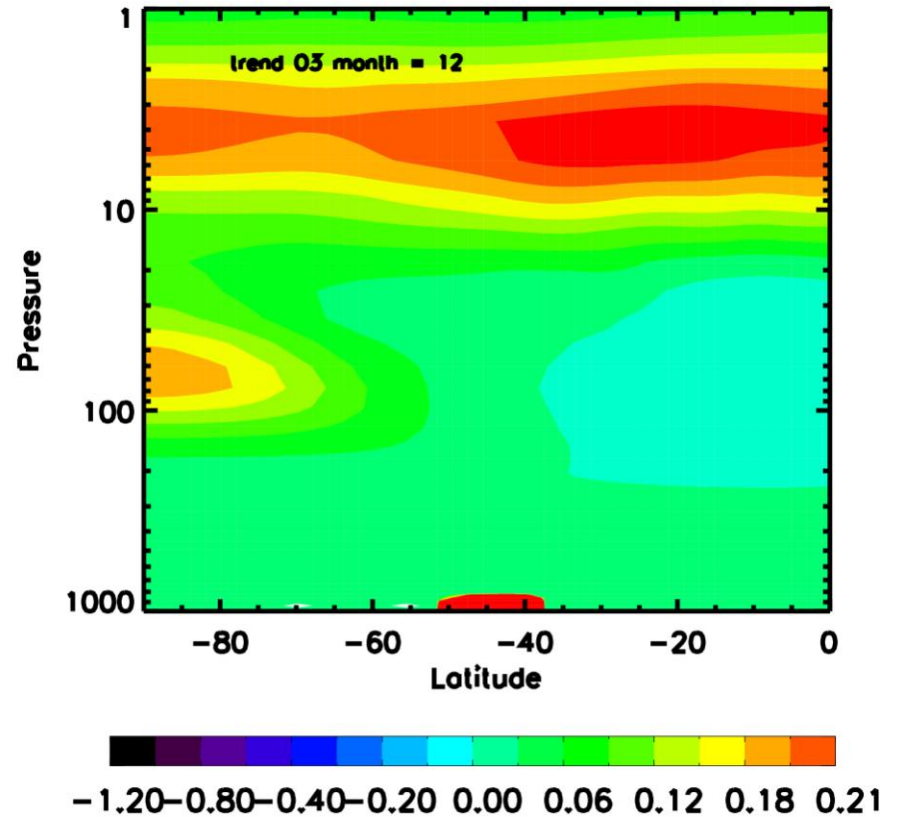
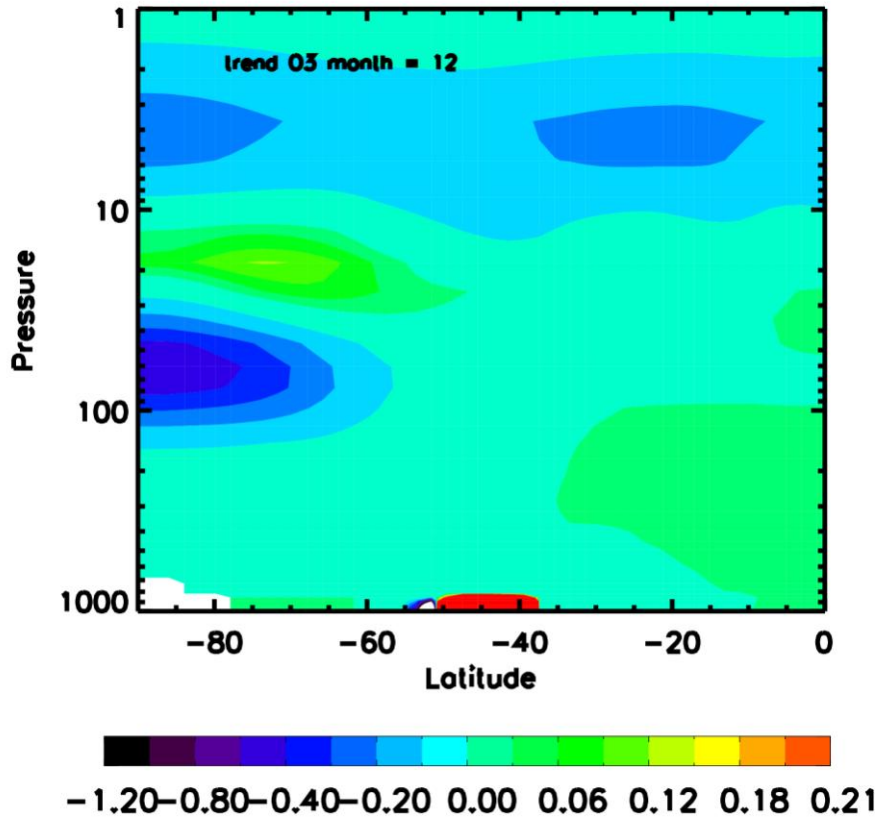
Preliminary work

- Examined the CCMVal model archive to establish the current 'state-of-the-art' of stratospheric chemistry-climate modelling
- Focusing on development & breakup of the Antarctic Ozone hole
- Results show broad range of model performance
- Surface fields required to study climate change not available - perhaps in next experiment (currently underway)

O3 trends

1980-2000

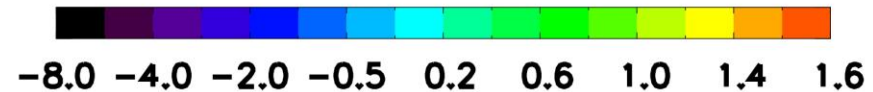
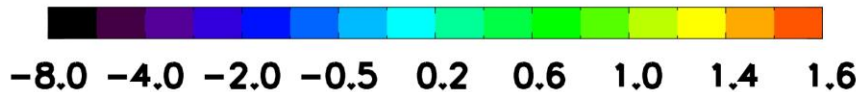
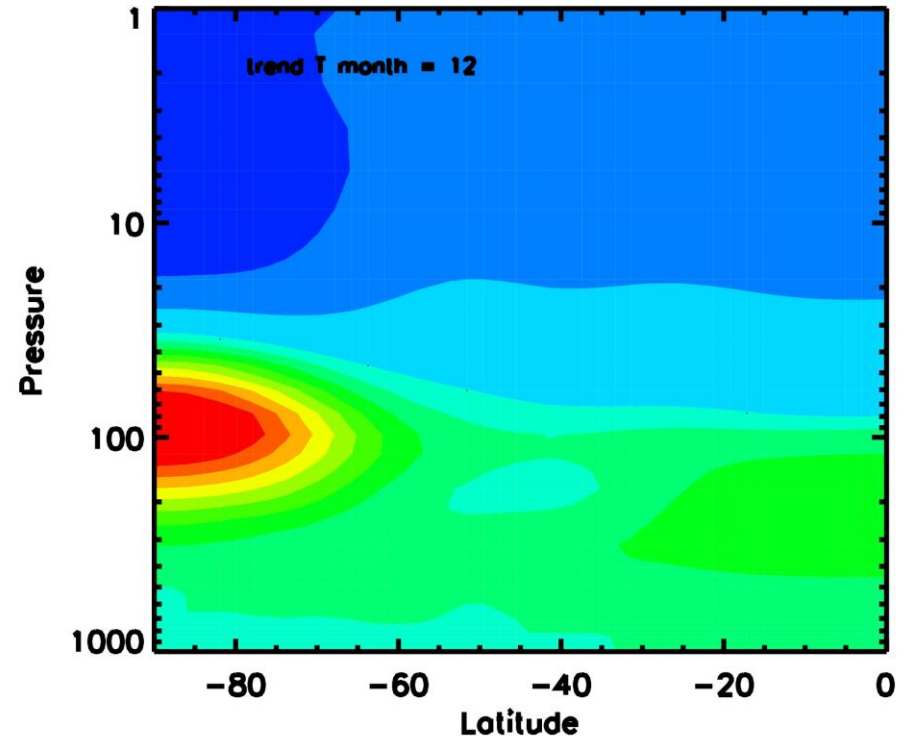
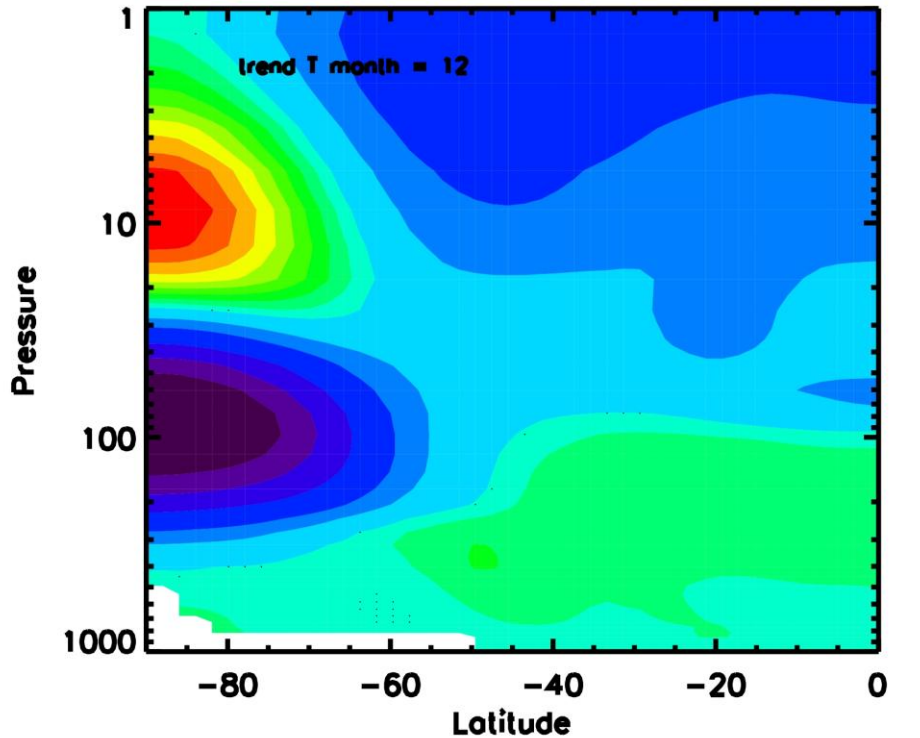
2000-2050



Temperature trends

1980-2000

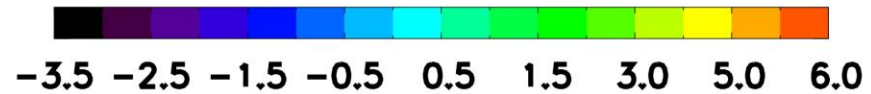
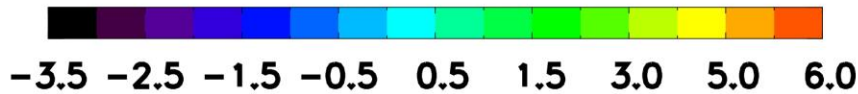
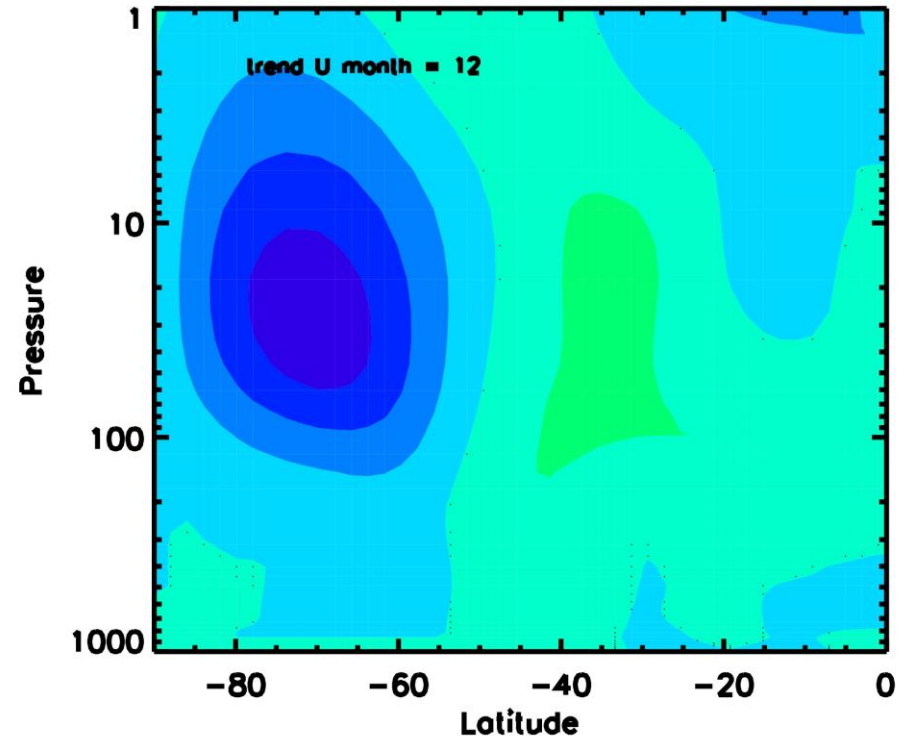
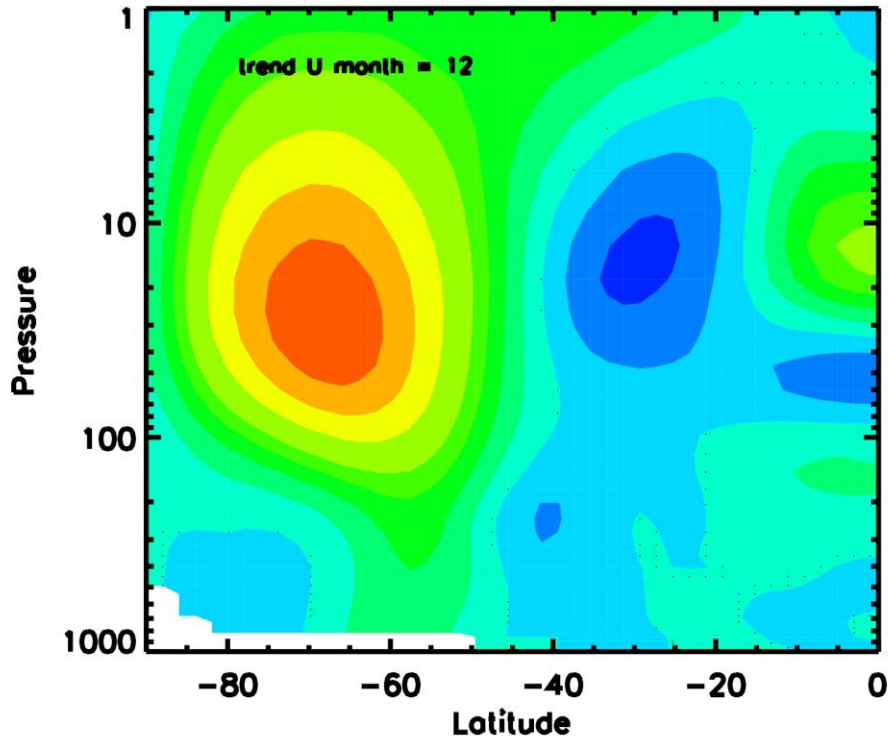
2000-2050



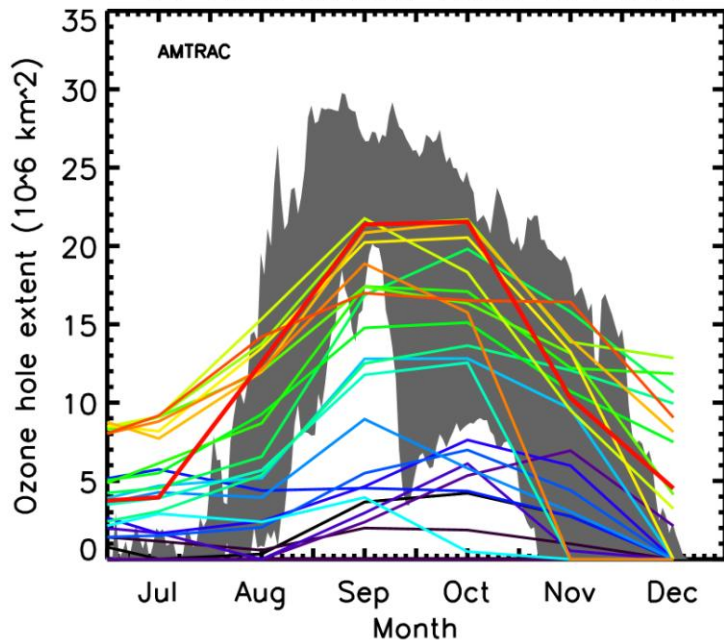
Zonal wind trends

1980-2000

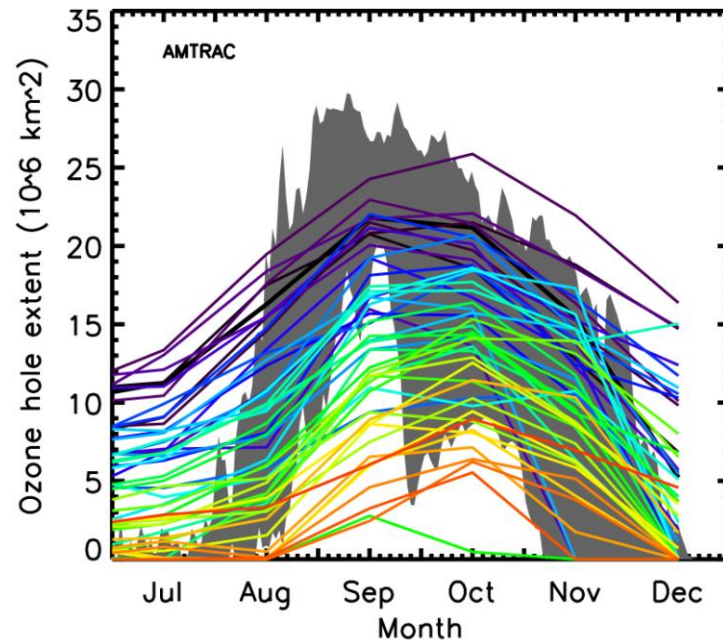
2000-2050



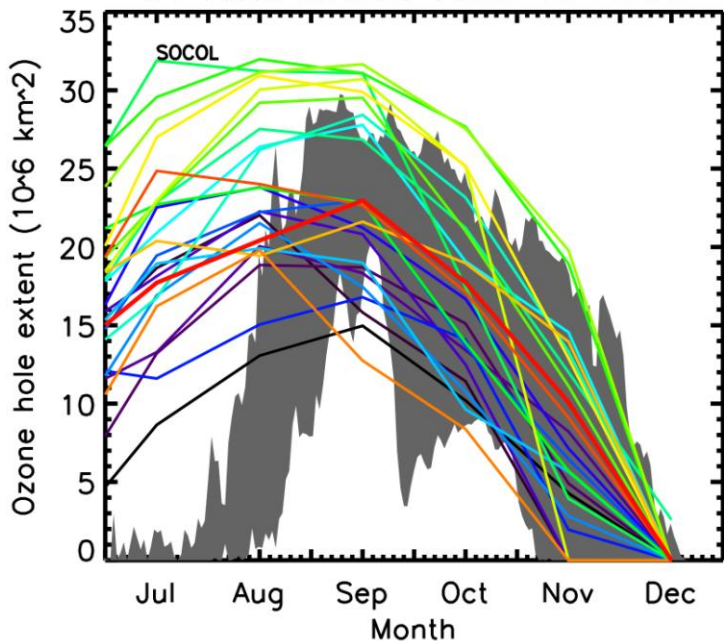
O3 hole extent 1980 to 2003



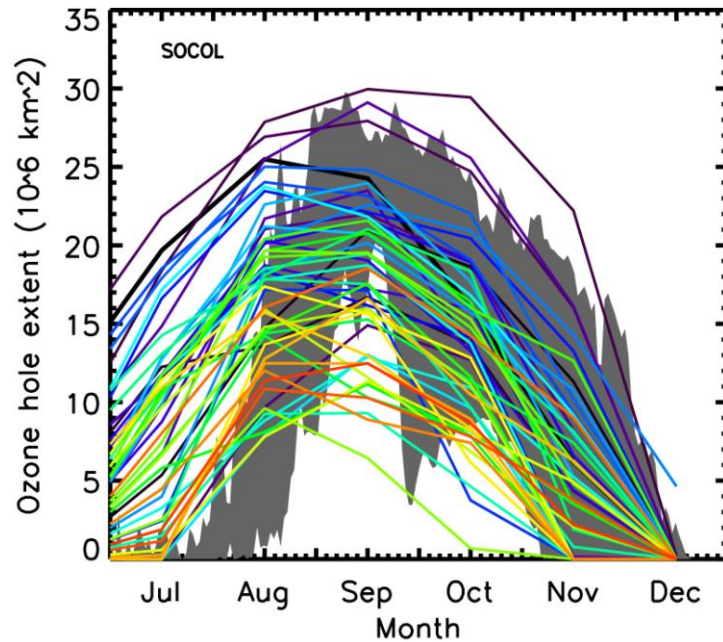
O3 hole extent 2000 to 2049



O3 hole extent 1980 to 2003



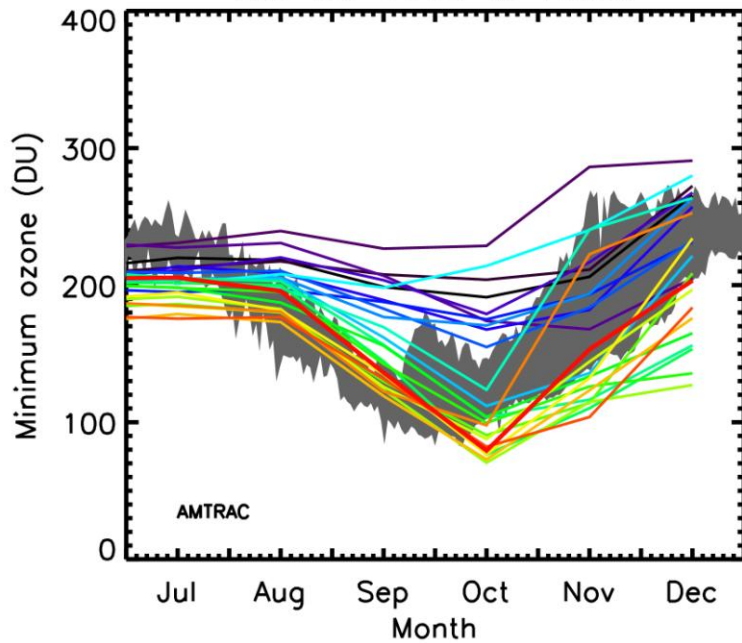
O3 hole extent 2000 to 2049



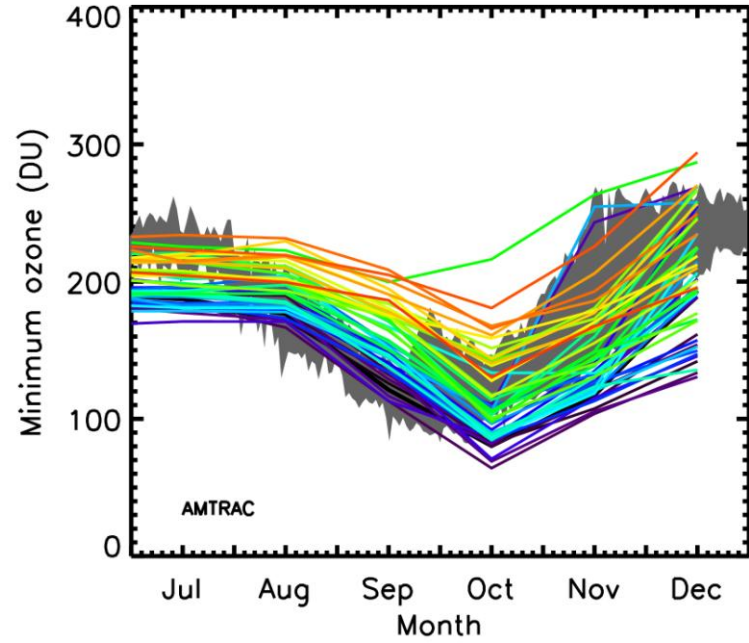
NCRAM



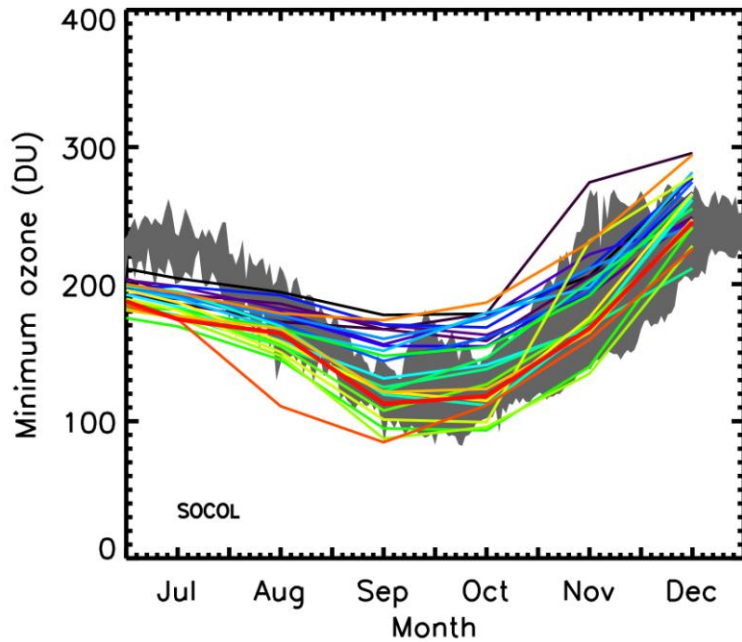
Min O3 1980 to 2003



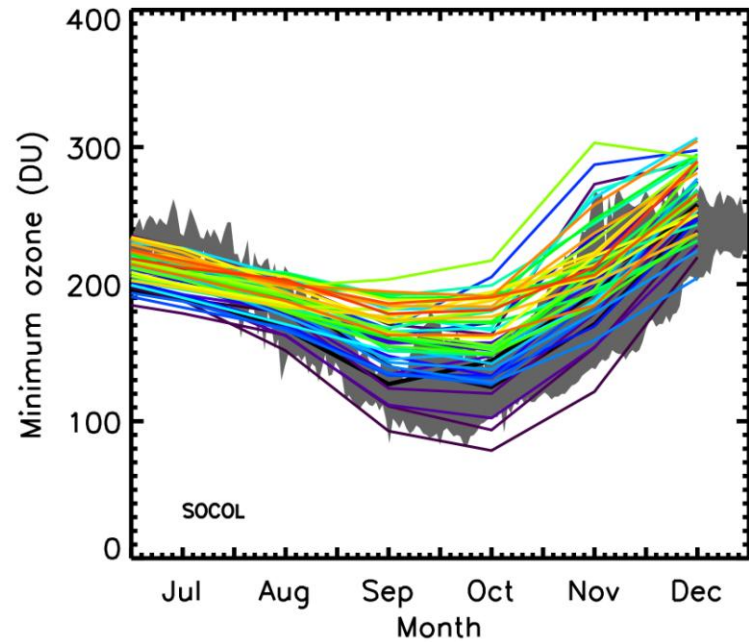
Min O3 2000 to 2049



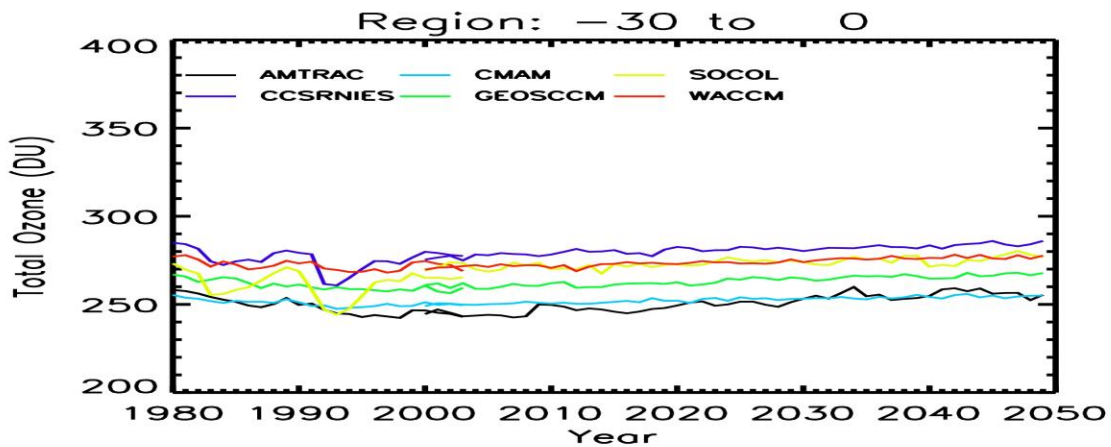
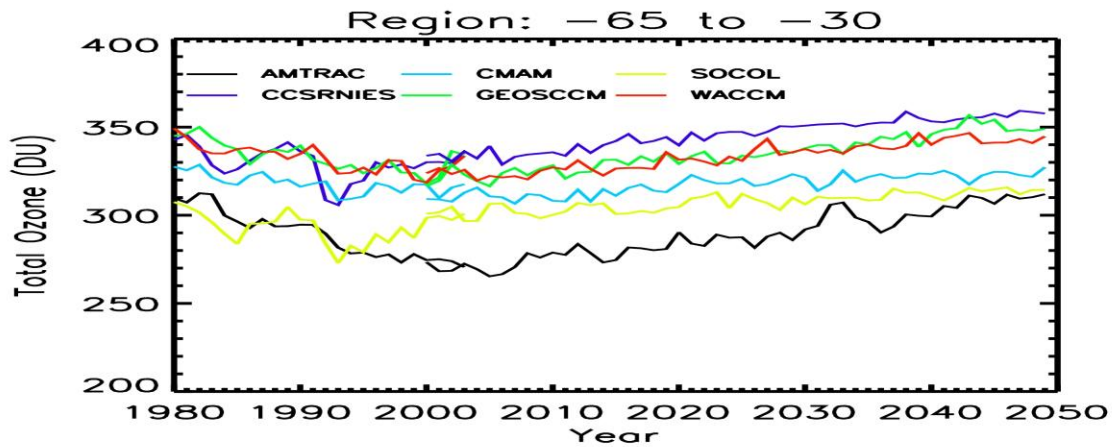
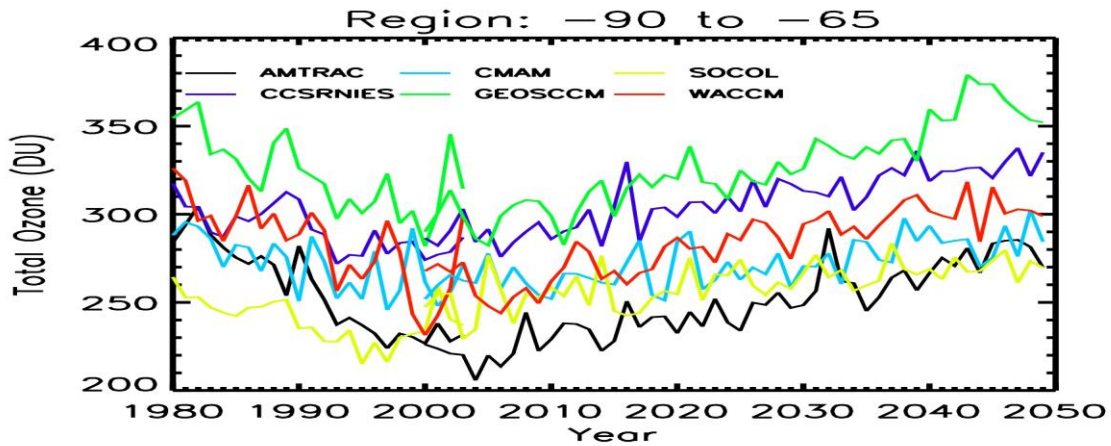
Min O3 1980 to 2003



Min O3 2000 to 2049



CAW



Future work

- Compare ozonesonde data with the CCMVal archives
- Compare IPCC 4AR models with and without ozone hole recovery
- Couple UKCA stratospheric chemistry to the UM within the ACCESS framework