Dear SCOUT-O3 modelers, **July 15, 2005**

To continue the model inter-comparisons for Activity 1 we like to request some more data from model runs 1980-1999. A detailed summary of the requested data is given below.

Some of the analyses will be lead by scientists outside the SCOUT-O3 community. Please confirm that you agree to Hamish Struthers working with data sent for A1, Thilo Erbersteder for A2, and Ross Salawitch for A4.

With this data request we would like to concentrate on the following comparisons:

A1.Dynamical containment of Antarctic ozone depletion (Analyses will be performed by Hamish Struthers). **Data needed: 2D** Single level October daily mean (latitude-longitude) wind fields on the 550K potential temperature surface; October daily mean (latitude-longitude) total column ozone; October daily mean (latitude-longitude) potential vorticity (PV) on the 550K potential temperature surface; Single level daily mean (latitude-longitude) temperature and PV on the 550K potential temperature surface (June-October).

Bodeker et al. [2002] used the NIWA total column ozone assimilated data set and NCEP/NCAR reanalysis to show that even though the ozone hole size, as measured by the 220DU contour, has increased from 1980 to 2000 the dynamical vortex area as diagnosed by the meridional impermeability has remained fixed. This implies the area of significant ozone loss has continued to fill the dynamical vortex over the last 20 years. In addition, the results suggest that in recent years the size of the ozone hole (as measured by the 220DU contour) has been constrained by the dynamical vortex rather than through the extent of chemical processing. Here, the analyses will be repeated using CCM output and the results will be compared with observations, focusing on whether CCMs capture the dynamical containment of ozone depletion as seen in the measurements.

A2.Hemispheric Ozone Variability Indices (Analyses will be performed by Thilo Erbertseder). **Data needed: 2D** Monthly mean total ozone as a function of longitude and latitude

Total column ozone itself can be used to trace the resulting variability due to coupled dynamical and chemical processes in the middle atmosphere. In order to quantify zonal and hemispheric total ozone variability we introduce the hemispheric ozone variability indices number one and two (Erbertseder et al., 2005). They are defined as the hemispheric mean amplitudes of the zonal wave numbers one and two, respectively, as traced by the total ozone field and derived by the spectral statistical technique Harmonic Analysis. Since the indices give a simple hemispheric measure of coupled dynamical and chemical total ozone variability they are suitable for a CCM intercomparison. The total ozone record from the TOMS provides an excellent reference, since it covers the variability with proven accuracy and considerable temporal and spatial resolution. Based on this record the diagnostic will be applied to evaluate the hemispheric ozone variability of the CCMs.

A3.QBO and SAO (Analyses will be performed by Marco Giorgetta). **Data needed: 2D** Zonal and monthly mean fields (latitude-pressure) of zonal wind, temperature, H_2O, O_3, and CH_4, and monthly mean fields as a function of longitude and latitude for total ozone, tropopause height, and tropopause temperature.

QBO/SAO comparison in zonal wind and effects on temperature, water vapour, ozone, and methane as well as on total ozone. QBO related analysis of tropopause height and tropopause temperature. QBO signals will be analysed as phase related composites, for example as composites for onset of westerlies at the equator at 20 hPa. This comparison will need data only from CCM simulations including the QBO. This analysis will use data of the requests D8 and D10.

A4.Chemistry assessment (Analyses will be performed by Ross Salawitch and Martyn Chipperfield). **Data needed: 2D monthly-mean zonal-mean chemical fields** for the full period (Jan 1980 - Dec 1999) and **3D chemical fields for three years** (*1999, most stable (coldest) NH vortex and most unstable (warmest) NH vortex over the time period 1990 to 1999*; 31 pressure levels defined in ICD) as snapshots twice a month (Day 1 and Day 15), output at fixed time (12 UTC).
In addition **2D fields of solar zenith angle** at the 3D output day/time (12 UTC).

For the species: O_3, T (temperature), U (zonal wind component), V (meridional wind component), H_2O, CH_4, Cly, Bry, O_{3s} (passive odd oxygen tracer), NO_y, N_2O,CO, HNO_3, density, CFC11, sulfate aerosol surface area, PSC Type I and Type II surface areas; $O(^3P)$, $O(^1D)$, OH, HO_2, NO, NO_2, N_2O_5, ClO, $ClONO_2$, HCl, HOCl, Cl_2O_2, OClO, H_2O_2, HBr, HOBr, $BrONO_2$, BrO, BrCl, Br, Br_2. For CCMVal SCN1 in addition: $CHBr_3$, CH_2Br_2

These fields will provide the data to test the chemistry schemes. The instantaneous (3D) output will be used to compare models with a standard photochemical box model and then with overall datasets from in-situ (e.g. ER-2) data. These fields will also be used to investigate the models' treatments of polar processing in the Arctic – hence the request for 1 common year (1999) and your model's extreme Arctic years in the 1990-1999 period. The 2D fields will be used for a comparison with satellite climatologies and for an overview comparison during the whole period (e.g. as aerosol levels change). Certain fields (e.g. PSC monthly surface area will also be an indication of temperature variability).

A5.Coupled modes (Analyses will be performed by Peter Braesicke and John Pyle). **Data needed:** **2D** Monthly mean geopotential heights as a function of longitude and latitude at 1000, 500, 200, 70, 50, 30 and 5 hPa; monthly mean partial total ozone column as a function of longitude and latitude between 380 and 550K; monthly mean total ozone column (model domain) as a function of longitude and latitude; Daily mean/synop (either 0 or 12UT) geopotential height as a function of longitude and latitude at 1000hPa.

This request will focus on geopotential heights and ozone. Empirical orthogonal functions (EOFs) and principal components (PCs) using singular value decomposition (SVD) will be derived. In addition, metrics and correlative measures to compare the model results with observational evidence (ERA-40) and with each other will be defined. First of all, the analyses will focus on the coupling between troposphere and stratosphere in the models and how the coupled modes are affecting the ozone distribution. With the knowledge of how coupled modes (and eigenmodes) are realised in the models, we will attempt to look into decadal changes of these modes. At a later stage the analysis will also assess possible future changes of coupled modes.

A6.ENSO events (Analyses will be performed by Elisa Manzini). **Data needed: 3D** monthly means for temperature, zonal wind, and geopotential height; and **2D** monthly mean total ozone as a function of longitude and latitude.

In order to evaluate the role of variations in sea surface temperatures associated with ENSO events on the Northern winter polar stratospheric circulation in chemistry climate models, construct composites of specified meteorological and chemical fields from time series of an ENSO index (such as sea surface temperature, SST, anomalies in the NINO 3 or NINO3.4 region), for cold, neutral and warm SST conditions, following Manzini et al (2004). The results will be compared to reanalysis.

A7. Tropical Tropopause Layer (Analyses will be performed by Markus Kunze and Ulrike Langematz). **Data needed:** **3D** monthly means for T (temperature), U (zonal wind component), V (meridional wind component), W (vertical velocity), H (geopotential height), Q (specific humidity), O3 (ozone), SHR (shortwave heating rates), LHR (longwave heating rates); **2D** Monthly Mean surface geopotential

This request will focus on processes in the tropical tropopause layer, i.e. tropical convection, cloud formation, cold point temperature, tropopause height, the mass transport across the tropical tropopause layer, in particular the transport of water vapor, and chemical composition. Changes (trends) in the TTL will be determined and quantified, and related dynamical, physical and chemical processes will be investigated.

IMPORTANT: While extracting the data, please follow the data format specified in the Interface Control Document (ICD) at
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html

We are planning to have first results ready for the CCMVal Boulder workshop. Therefore, we would appreciate if you can send data as soon as possible, but not later than **August 15**.

The data will be collected on the BADC (British Atmospheric Data Centre) FTP site for **Analyses A1, A2, A3, A4, and A5** and on the FUB FTP site for **Analyses A6 and A7**.

If you have forgotten details of either of these sites please contact

- Neal Butchart (neal.butchart@metoffice.gov.uk) and Veronika Eyring (Veronika.Eyring@dlr.de) for the **BADC FTP site**.
- Markus Kunze (kunze@strat01.met.fu-berlin.de) and Ulrike Langematz (lang@strat01.met.fu-berlin.de) for the **FUB FTP site**.

Thank you for your cooperation and we hope to see many of you at the CCMVal 2005 workshop in Boulder (http://www.pa.op.dlr.de/workshops/CCMVal2005).

The deadline for registration and abstract submission is Friday, July 15.

Best regards,

Neal Butchart, Veronika Eyring and Ulrike Langematz

On behalf of SCOUT-O3 activity 1
Attached please find a summary of the requested data.

Summary of requested data

D1. Single level October daily mean (latitude-longitude) wind and PV fields on the 550K potential temperature surface and total ozone column

Data format defined under bullet **ICD 11** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

Daily mean zonal wind October (550K) (NAME: **Dailyu_Oct_latlon_${MODEL}**)
Daily mean meridional wind October (550K) (NAME: **Dailyv_Oct_latlon_${MODEL}**)
Daily mean total column ozone October (NAME: **DailyTOZ_Oct_latlon_${MODEL})**
Daily mean PV October (550K) (NAME: **DailyPV_Oct_latlon_${MODEL}**)

D2. Single level June-October daily mean (latitude-longitude) temperature and PV fields on the 550K potential temperature surface

Data format defined under bullet **ICD 12** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

Daily mean temperature June-October (550K) (NAME: **DailyT_JunetoOct_latlon_${MODEL}**)
Daily mean PV June-October (550K) (NAME: **DailyPVd2_ JunetoOct_latlon_${MODEL}**)

D3. Monthly mean geopotential heights as a function of longitude and latitude at 1000, 500, 200, 70, 50, 30, and 5 hPa.

Data format defined under bullet **ICD 13** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

Monthly mean GP at various heights (NAME: **MEAN_GPsel_latlon_${MODEL}**

D4. Monthly mean partial total ozone column as a function of longitude and latitude between 380 and 550K.

Use same data format as specified for total column ozone. Data format defined under bullet **ICD 2a** see http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

Monthly mean partial ozone column
(NAME: **MEANTOZ_380to550K_LATLON_${MODEL}**)

D5. Daily mean/synop (either 0 or 12UT) geopotential height as a function of longitude and latitude at 1000hPa

Data format defined under bullet **ICD 15** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

Daily mean GP at 1000 hPa (NAME: **DAILYGP1000_latlon_${MODEL})**

D6. Zonally averaged mean tropopause temperature and tropopause humidity

Data format defined under bullet **ICD 7b** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

Zonally averaged topopause Temperature and Humidity

(NAME: **ZONMEANTPT_lat_${MODEL},**
ZONMEANTPHum_lat_${MODEL})

D7. 3D- chemical fields for three years (1999, most stable (coldest) NH vortex and most unstable (warmest) NH vortex over the time period 1990 to 1999), 31 pressure levels defined in ICD; Snapshots twice a month (Day 1 and Day 15), output at fixed time (12 UTC).

Data format defined under bullet **ICD 10c and d** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

3d Snapshots for three years

Filenames: **SNAP_ Day{x}_{var}_latlonh_${MODEL}**
X='01' or '15'
Var= O_3, T (temperature), U (zonal wind component), V (meridional wind component), H_2O, CH_4, Cly, Bry, O3s (passive ozone tracer), NOy, N_2O, CO, HNO_3, density, CFC11, Sulfate aerosol surface area, PSC Type I and Type II surface areas; O^3P, O^1D, OH, HO_2, NO, NO_2, N_2O_5, ClO, $ClONO_2$, HCl, HOCl, Cl_2O_2, OClO, H_2O_2, HBr, HOBr, $BrONO_2$, BrO, BrCl, Br, Br_2

e.g. (NAME: **SNAP_Day01_CH4_latlonh_${MODEL}**)
(NAME: **SNAP_Day15_CH4_latlonh_${MODEL}**)
etc.
In addition 2D fields of solar zenith angle at 3D output days/times (12 UTC)
(NAME: **SNAP_Day01_SZA_latlon_${MODEL}**)
(NAME: **SNAP_Day15_SZA_latlon_${MODEL}**)

D8. 2D monthly zonal means (latitude-pressure; 31 pressure levels defined in ICD) for temperature, ozone, water vapor and zonal wind

Data format defined under bullet **ICD 10a** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at BADC ftp site

Filenames**: ZONMEAN_{var}_lath_${MODEL}**
2d Monthly Mean fields for (nb same list as for 3d fields)
Var= O_3, T (temperature), U (zonal wind component), V (meridional wind component), H_2O, CH_4, Cly, Bry, O3s (passive ozone tracer), NOy, N_2O, CO, HNO_3, density, CFC11, Sulfate aerosol surface area, PSC Type I and Type II surface areas; O^3P, O^1D, OH, HO_2, NO, NO_2, N_2O_5, ClO, $ClONO_2$, HCl, HOCl, Cl_2O_2, OClO, H_2O_2, HBr, HOBr, $BrONO_2$, BrO, BrCl, Br, Br_2
In addition for CCMVal SCN1: $CHBr_3$, CH_2Br_2

e.g.

Monthly mean O3	(NAME: **ZONMEAN_O3_lath_${MODEL}**)
Monthly mean T	(NAME: **ZONMEAN_T_lath_${MODEL}**)
Monthly mean U	(NAME: **ZONMEAN_U_lath_${MODEL}**)
Monthly mean V	(NAME: **ZONMEAN_V_lath_${MODEL})**
Monthly mean H2O	(NAME: **ZONMEAN_H2O_lath_${MODEL})**
Monthly mean CH4	(NAME: **ZONMEAN_CH4_lath_${MODEL}**)
Monthly mean Cly	(NAME: **ZONMEAN_Cly_lath_${MODEL}**)

etc.

For the CCMVal simulation **SCN1** (excess bromine) we would ask you to output bromoform ($CHBr_3$) and dibromethane (CH_2Br_2) in addition to the list above.

Monthly mean CHBr3 (NAME: **ZONMEAN_ CHBr3_lath_${MODEL}**)
Monthly mean CH2Br2 (NAME: **ZONMEAN_ CH2Br2_lath_${MODEL}**)

D9. 2D monthly mean surface geopotential

Data format defined under bullet **ICD 17** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at FUB ftp site

(NAME: **MEAN_G_latlon_${MODEL}**)

D10. 3D monthly means at 31 pressure levels (defined in ICD) for the following variables:

Data format defined under bullet **ICD 16** on the ICD website
http://www.pa.op.dlr.de/SCOUTO3/InterfaceControlDocument.html
Data stored at FUB ftp site

3d Monthly mean T (temperature), U (zonal wind component), V (meridional wind component), W (vertical velocity), H (geopotential height), Q (specific humidity), O3 (ozone), SHR (shortwave heating rates), LHR (longwave heating rates)

Name**: MEAN_{var}_latlonh_${MODEL}**
var=T,U,V,W,H,Q,O3,SHR,LHR