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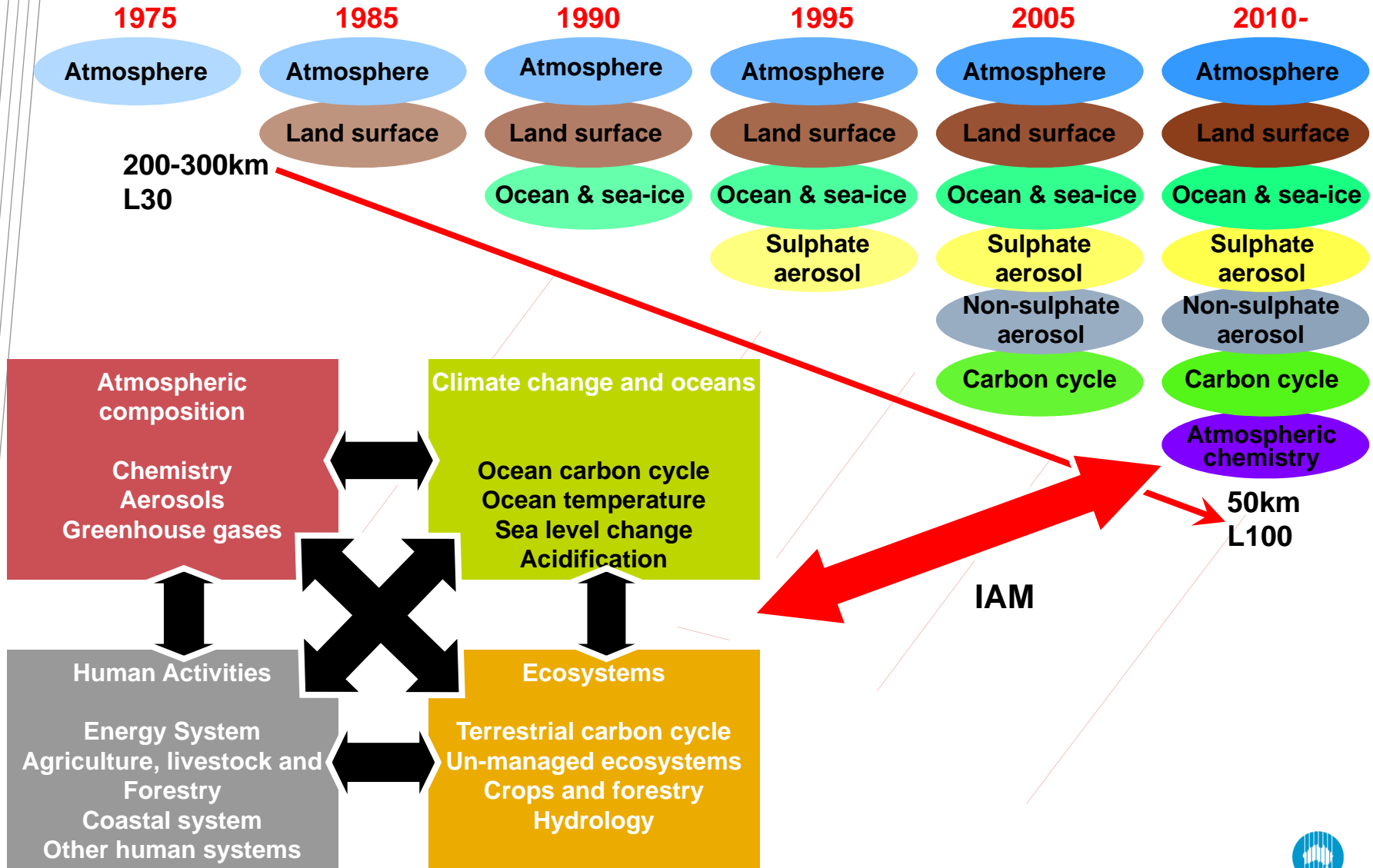
Climate Chemistry Modelling using the UK Chemistry and Aerosols Model within ACCESS: Tropospheric Chemistry

Peter Hurley, Marcus Thatcher, Mary Edwards,
Holger Wolff and Ashok Luhar

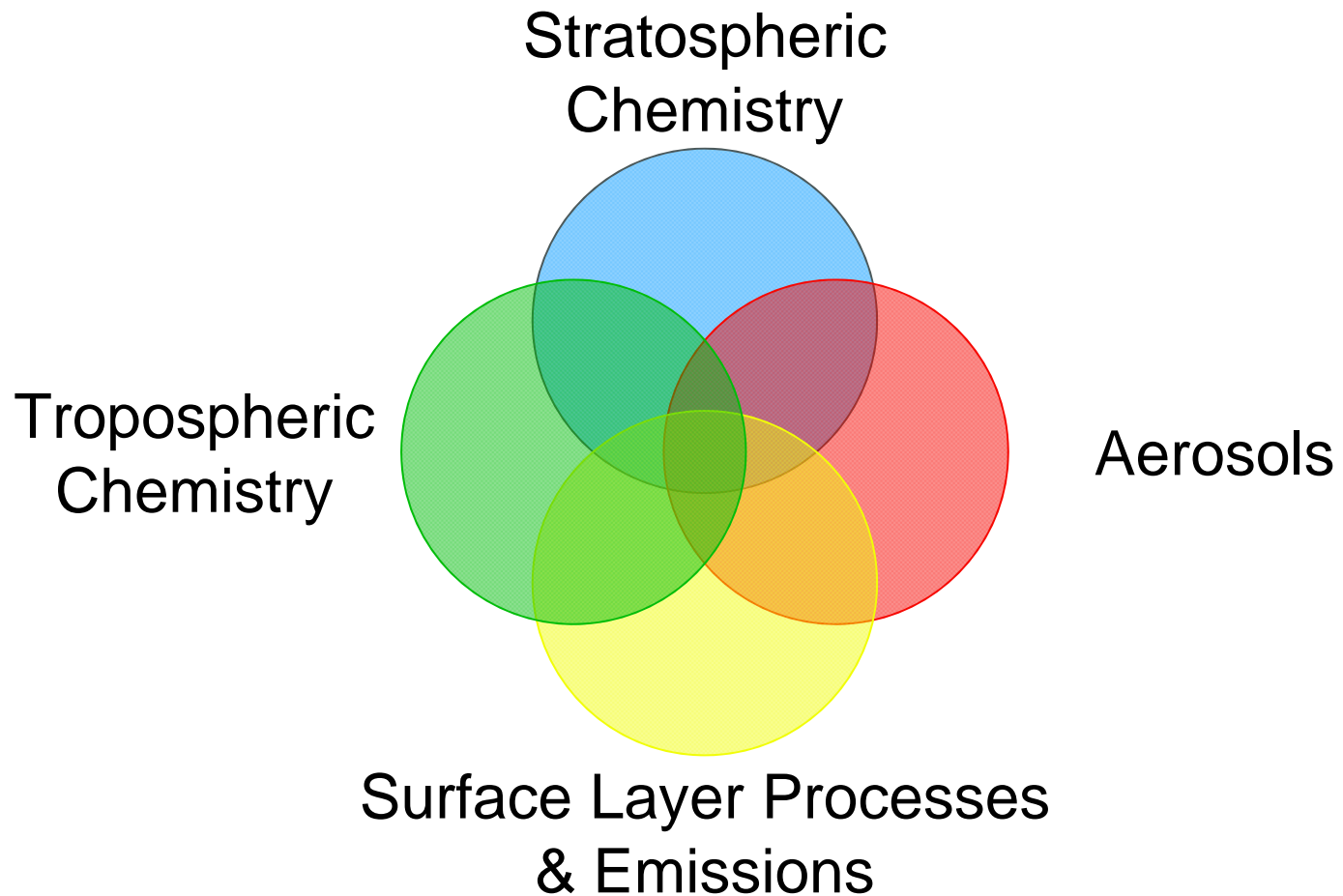
With thanks to Colin Johnson, Nick Hannah and Martin Dix



ESM Future Directions



Chemical Cycles of non-CO2 Gases & Aerosols



ACCESS non-CO2 Gases & Aerosols

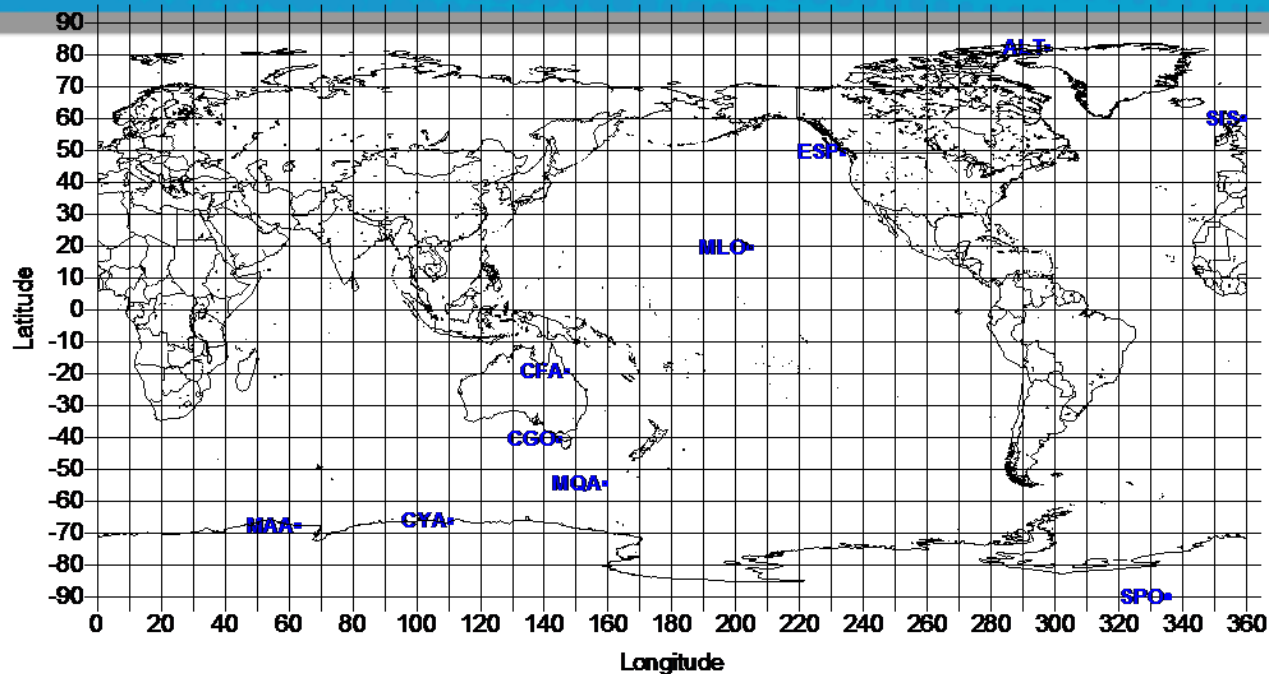
- **UM Aerosols (current)**
 - CLASSIC Aerosol Scheme (Met Office)
- **UM + UKCA (UK Chemistry & Aerosols Model)**
 - Tropospheric Chemistry (Met Office)
 - Stratospheric Chemistry (Cambridge Uni)
 - MODE Aerosol Scheme (Leeds Uni)
- **Surface Layer Processes and Emissions (Sources & Sinks)**
 - Integrated Fluxes of Chemical Species
 - Wet and Dry Deposition
 - Atmosphere (UM Physics, e.g. Boundary Layer)
 - Land Surface (UM MOSES transitioning to CSIRO CABLE)
 - Ocean & Sea Ice (AUSCOM – MOM+CICE via OASIS)
 - Anthropogenic Emissions (e.g. IPCC AR5 Databases)
 - Natural Emissions (Databases/Interactive)
 - Add Australian Regional Content? (e.g. Emissions, Processes, etc)

ACCESS Tropospheric Chemistry

- Progress (so far)

- Model Simulations UM+UKCA vn6.6-7.3
 - Annual Runs (1979, 2000)
 - Decadal Runs (1990-2000)
 - AMIP Style Runs (1980-2000)
- Model Options
 - Tropospheric Chemistry & CLASSIC Aerosols
 - Sensitivity to Initial Conditions (e.g. 3-d vs constant)
 - Sensitivity to Emissions (e.g. simple scaling of methane)
 - With/without Radiation Feedback (e.g. Methane, Ozone)
 - With/without Interactive Dry Deposition
- Model Evaluation
 - AGAGE and CSIRO Surface Networks
 - GEMS Chemical Species Reanalyses

ACCESS Tropospheric Chemistry



CSIRO
Network

SiteCode	SiteName	SiteType	Longitude	Latitude
ALT	Alert (Canada)	Global	-62.52	82.45
CFA	Cape Ferguson (Australia)	Regional	147.05	-19.28
CGO	Cape Grim (Australia)	Global	144.68	-40.68
CYA	Casey Station (Australia)	?	110.53	-66.28
ESP	Estevan Point (Canada)	Regional	-126.55	49.38
MAA	Mawson (Australia)	Regional	62.87	-67.62
MLO	Mauna Loa (USA)	Global	-155.578	19.539
MQA	Macquarie Island (Australia)	Regional	158.97	-54.48
SIS	Shetland (UK)	Regional	-1.25	60.08
SPO	South Pole	Global	-24.8	-89.98

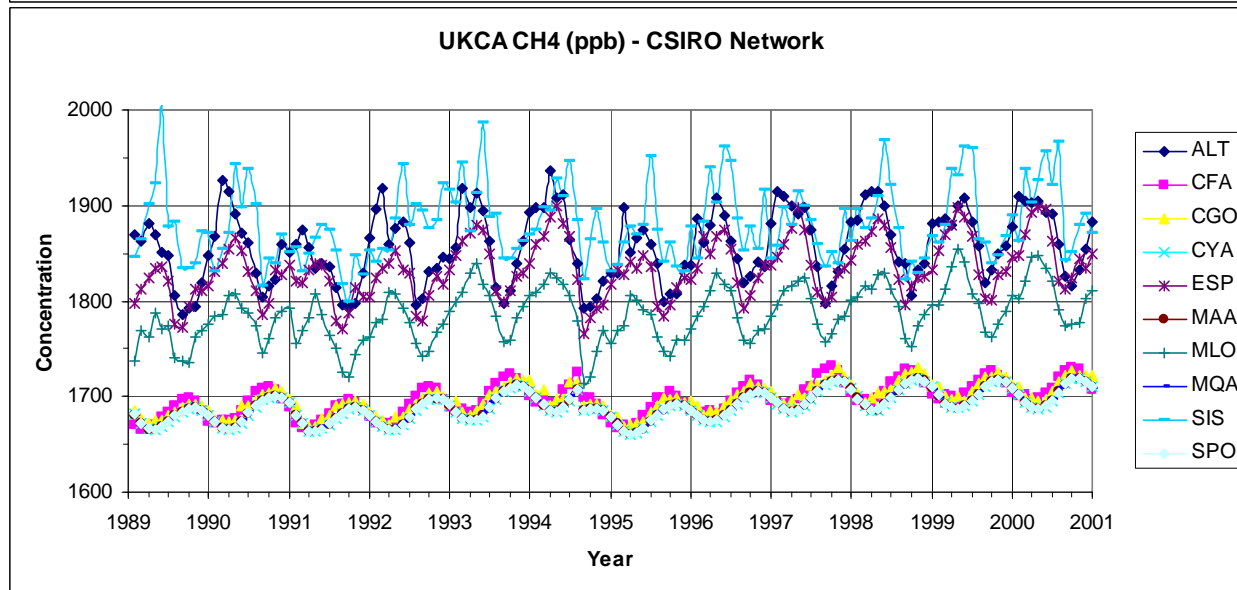
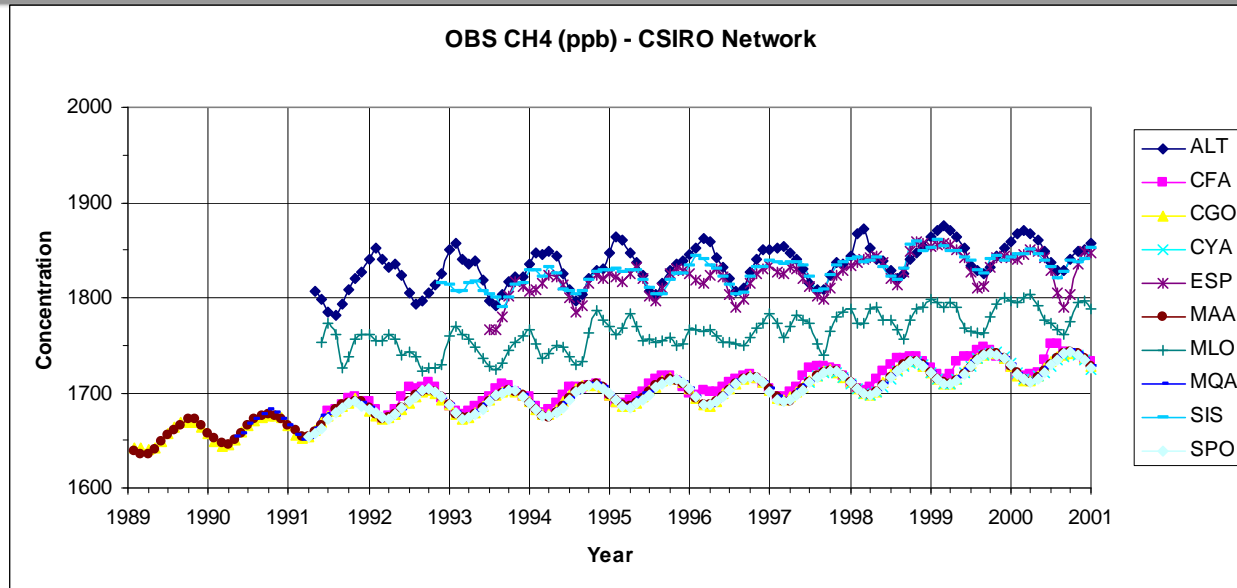
Source:

WDCGG: World Data Centre for Greenhouse Gases

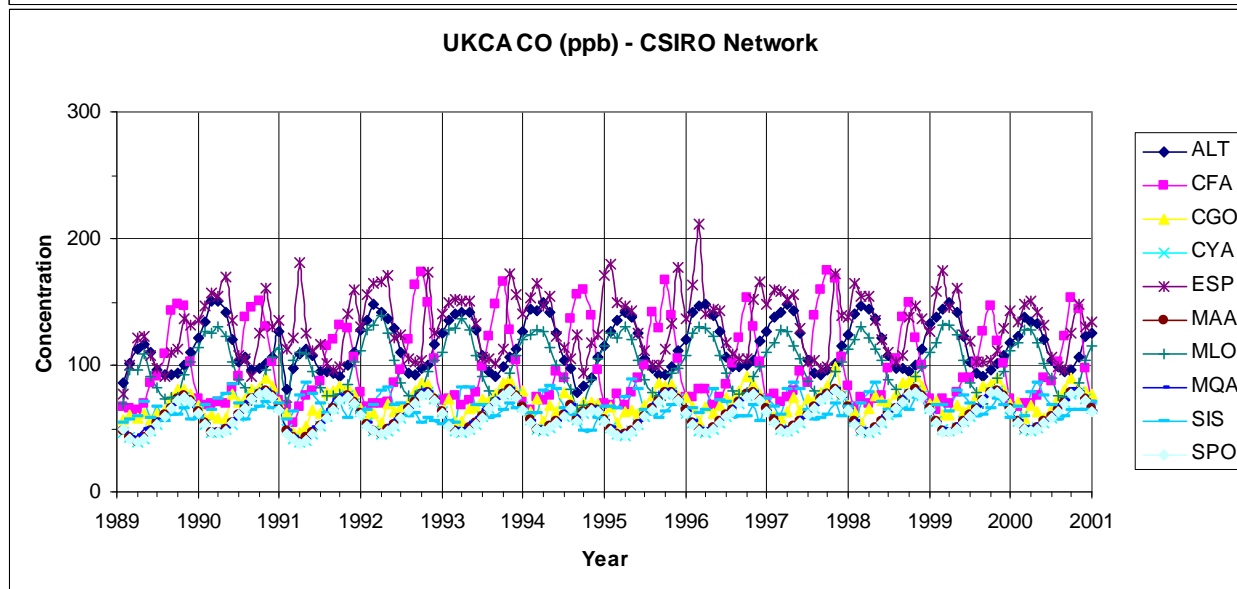
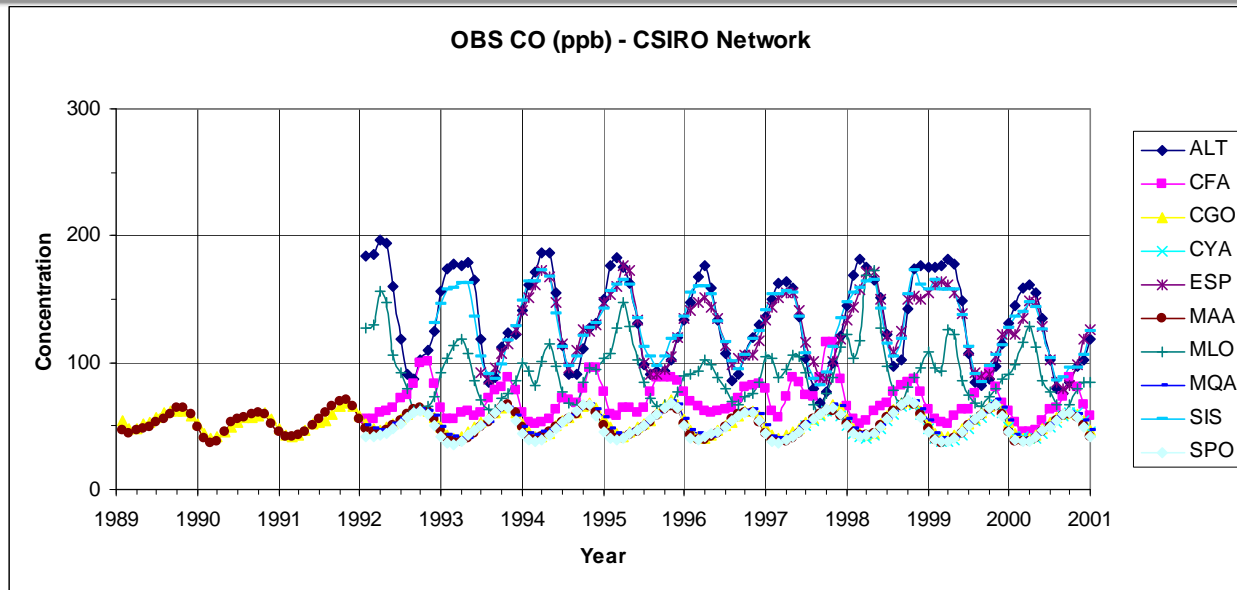
Acknowledgements:

Paul Krummel, Paul Steele, Ray Langenfelds

ACCESS Tropospheric Chemistry



ACCESS Tropospheric Chemistry



ACCESS Tropospheric Chemistry

- Progress (future)

- Model Simulations UM+UKCA vn7.3 and beyond
 - AMIP Style Runs (1980-2010)
 - AMIP Style Runs (1980-2010) with Meteorological Nudging
 - CMIP Style Runs (Historic/Future)
 - IPCC AR6 Contribution
- Model Options
 - Tropospheric Chemistry & CLASSIC Aerosols
 - Tropospheric/Stratospheric Chemistry & CLASSIC Aerosols
 - Tropospheric/Stratospheric Chemistry & MODE Aerosols
 - Process Development (e.g. linkages to ACCESS Components)
 - Emissions Development (e.g. Regional, Natural, Interactive)
- Model Evaluation
 - AGAGE and CSIRO Surface Networks
 - GEMS Chemical Species Reanalyses
 - Satellite Products
 - Ground-Based Profilers