Towards a new Assessment?

SPARC Report No. 2, 2000
WCPR – 113, WMO/TD - No. 1043

Topics:
- Instrumentation and data sets
- Data quality
- Distribution and variability of water vapour in the UTLS

Key findings:
- Increase of stratospheric H$_2$O since 1950, 1%/y
- Reasons for the increase quantitatively not understood
- Long-term changes of UTH difficult to assess

The new SPARC Water Vapour Initiative
SPARC Newsletter No. 30, 2008

Why now?
- New instruments and new/continued data sets
- New data/instrument quality approaches
- Stratospheric trend has changed
- A new topic: The supersaturation ‘puzzle’
- Improved knowledge about processes
- Improved tools for impact studies and prediction

Data quality

In-situ, advanced hygrometers for low mixing ratios
- discrepancy in-field data
- laboratory intercomparison (AquaVIT 2007)
- assessment of absolute errors, not only relative discrepancies

Satellite and other remote sensing
- long records: synthesised data sets of different instruments
- assessment of the ability to measure H$_2$O at the tropopause

UTH data
- operational satellites
- radiosondes
- in-service aircraft programmes (as MOZAIC/IAGOS)
- quality assessment (e.g. GRUAM)

Temperature

Clear air + in-cloud supersaturation

How good are the data?
- Water vapour
- Temperature

Potential out-of-cloud effects
- Lack of preexisting aerosol
- Low mass accommodation of H$_2$O on aerosol
- Formation of glasses
- Surface nucleation
- Underestimated vapour pressure of supercooled water

Potential in-cloud effects
- Control by ice nuclei
- Mesoscale temperature fluctuations
- Subresolution patchiness
- HNO$_3$ deposition on ice, forming NAT
- Low mass accommodation of H$_2$O on ice
- Cubic ice

Peter et al., When dry air is too humid, Science, 314, 2006.
Peter et al., Upper tropospheric humidity, A report on an international workshop
SPARC Newsletter 30, 2008

UTS water vapour changes

Observation of long-term changes of UTS water vapour
- Update and continuation of SPARC H$_2$O data base
- Stop of increase of stratospheric H$_2$O after 2000
- Improved capabilities to investigate UTH compared to 2000?

Processes causing changes of H$_2$O in the UTS
- Tropopause temperature
- CH$_4$ increase
- Tropical entry and BD circulation
- SST, climate change

Climate impact and future changes
- Radiative forcing by changing UTS water vapour
- Chemical impact (e.g. ozone layer)
- Prediction of future changes

Kick-off meeting
Wednesday, September 3, 2008
1400 – 1730