VERTICAL TRANSPORT IN THE TTL AND LOWER STRATOSPHERE FROM CALIPSO

J. P. Vernier and J. P. Pommereau
Service d’Aéronomie IPSL/CNRS, Verrières-le-Buisson cedex, France

Instrument
- CALIOP Lidar onboard CALIPSO satellite of the Aqua-Train constellation

Data
- CALIOP: Total & perpendicular attenuated backscatter 532nm:
  - $\beta_{\perp}$ & $\beta_{\parallel}$
- NASA GEOS 5 model:
  - Air density, ozone density
  - Temperature and pressure

Treatment
- Average:
  - Nighttime orbits only (less noisy)
  - 1° latitude on each orbit (~300 profiles)
- Interpolation:
  - Mean map per 16-day period (CALIPSO repeat cycle)
  - Regular grid (lon=2°, lat=1°, z=200m)
- Correction of two-way transmission ($T^2$) for molecular attenuation and O3 absorption:
  - Clouds mask from depolarization ratio (threshold: $\beta_{\perp}/\beta_{\parallel} > 5\%$)
- Mask of the South Atlantic Anomaly (SAA)
- Molecular backscatter ($\beta_{\parallel}$) calculation from GEOS 5 model
- Display: Scattering ratio $R = \beta_{\parallel}/\beta_{\perp}$
- Recalibration compared to operational data assuming 35-39km level aerosols free

- Correction of two-way transmission ($T^2$) for molecular attenuation and O3 absorption: $\beta_{\perp} = T^2 \beta_{\perp}$
- Clouds mask from depolarization ratio (threshold: $\beta_{\perp}/\beta_{\parallel} > 5\%$)
- Mask of the South Atlantic Anomaly (SAA)
- Molecular backscatter ($\beta_{\parallel}$) calculation from GEOS 5 model
- Display: Scattering ratio $R = \beta_{\parallel}/\beta_{\perp}$
- Recalibration compared to operational data assuming 35-39km level aerosols free

Volcanoes:
- Manam (4°S, 145°E), 27 Jan 2005, Papua New Guinea
- Soufrière Hills (16°N-62°W), 20 May 2006, Montserrat Island, West Indies
- Tavuvur (4°S, 152°E), 7 October 2006, Papua New Guinea
- Jebel-Al-Tair (15°N-42°E), 30 September 2007, Yemen

Brewer-Dobson circulation:
- Volcanic tape recorder
- Vertical velocity:
  - Zero at 20km (seen on volcanic aerosols and clean air in Apr-Jul 2008)
  - 0.1mm/s (0.3km/month) between 21-25km

Tropospheric clean air injection:
- Up to 20km, within 0.5 month
- During convective season: NH Jul-Sept, SH Feb-Apr (more intense)

Aerosols between 15-17km:
- In Apr-Aug
- Mineral dust? biomass burning?

Acknowledgement: The authors thank J. Pelon and A. Garnier (CALIPSO team), the SCOUT-O3 project, the ICARE team, P. Keckut and F. Cairo for the fruitful discussion about CALIPSO.