Tropospheric ozone columns from S5P/TROPOMI

Wissen für Morgen

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Outlook

– Method

- Operational Product: Convective cloud differential (S5P CCD)
- Research Product: Combined TROPOMI with assimilated MLS (S5P-BASCOE(

– Comparison

- S5P-CCD versus OMI and GOME-2 CCD
- S5P-BASCOE versus CCD
- Results
 - Global
 - Central Africa
 - Northern America
 - Mediterranean
 - East Asia



Retrieval Algorithms



Comparison between OMI / GOME-2 CCD tropospheric O3 column and TROPOMI CCD

- OMI / GOME-2 based on CCI GODFIT total columns
 - Similar to S5P OFFL total columns
 - But use different cloud products
- CCD algorithm similar to S₅P:
 - Top of tropospheric column at 270hPa
 - Resolution of 1° x 2°
- Good agreement to OMI
- Overestimation compared to GOME-2 B affected by daily O₃ cycle?



Tropospheric ozone



Tropospheric Ozone Trends (CCD on GOME, SCIAMACHY, OMI, GOME-2)

– CCI project

- CCD retrieval using GODFITv4 total ozone data from GOME, SCIAMACHY, OMI, GOME-2 (A & B)
- Harmonized time series from 1995 to 2018 (23 Years)
- Resolution 2.5° x 1.25°

– Monthly means

Heue et al AMT, 2016 Global tropical trend 0.753 ± 0.122 DU/decade Update with data up to 2018 Global tropical trend 0.724 ± 0.112 DU/decade

trend in tropospheric column ozone







S5P CCD Tropospheric O₃ Validation



S₅P BASCOE Tropospheric O₃ Validation using Sondes

- Validation for April 2018 to March 2019
- Highest number of sonde data in Northern midlatitude
- Mostly small positive bias
- Largest deviations in polar regions

 Thanks to all the PIs of the Soundings stations for providing the data to SHADOZ and to the World Ozone and Ultraviolet Radiation Data Centre





Comparison between the S5P CCD and BASCOE tropospheric ozone columns

Different tropopause levels Mean 9.83 DU



Climatology added to CCD to correct for different tropopause levels Mean 1.86 DU





S₅P BASCOE



Central Africa in June 2018

tropospheric_ozone_colum_S5P_BASCOE_mean

tropospheric_ozone_colum_S5P_CCD_mean



Fires June 2018 Modis Active fires https://fires.globalforestwatch.org/map/



South-Eastern US in July 2018



East Asia in August 2018 and yearly cycle



Beijing 39.90 N 116.39 E



Summary

- S5P CCD is an operational TROPOMI product and regularly validated

– S5P BASCOE is a research TROPOMI product, initial validation performed

– Good agreement between S5P-BASCOE and S5P-CCD when altitude difference is considered

- High tropospheric ozone columns were observed over
 - Atlantic ocean close to Central Africa
 - South eastern US transport to the east Atlantic
 - East Asia Transport from China over Korea to Japan

