

Retrieval of ozone in the lower troposphere: Synergetic use of TES and OMI measurements

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Ozone profile retrieval from UV and IR measurements

- OMI measurements in the UV do not contain enough information to retrieve tropospheric ozone.
- TES measurements contain more information on tropospheric ozone but are less sensitive to ozone in the lower part of the troposphere.

The simultaneous use of co-aligned OMI and TES measurements provides additional information on ozone in the lowest 4 km of the troposphere.

Noise model

Shot noise scenario:

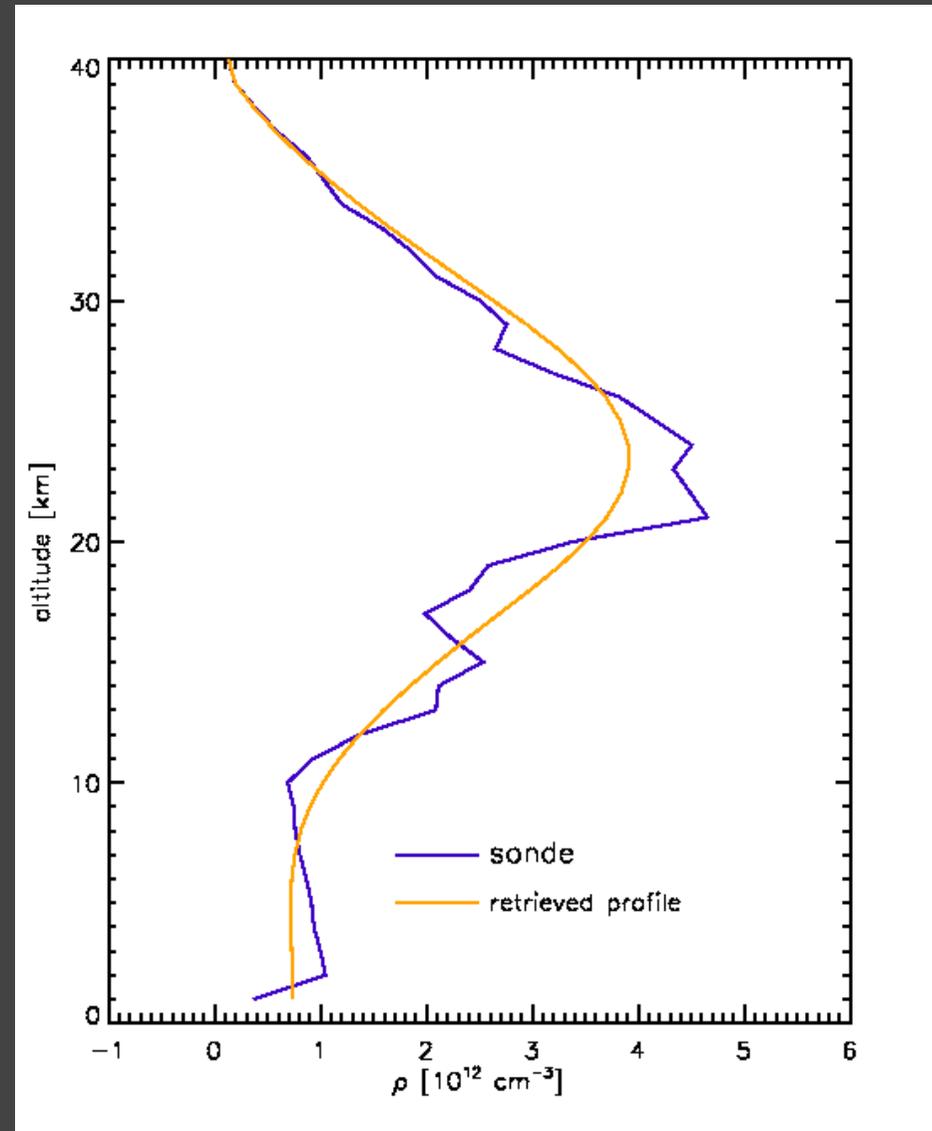
- For the UV the shot noise contribution is estimated from OMI instrument characteristics like field of view, integration time, instrument transmission...
- For the IR we assume a SNR of 500

Noise floor scenario:

- For the UV: shot noise scenario plus additional noise floor of 0.4%
- For the IR: SNR of 250

Regularization of the ill-posed inversion

- Due to the regularization the retrieved profile is a smoothed version of the real profile.
- The difference between both is the smoothing error.
- The smoothing error for a representative set of profiles shows the information content of the measurement.



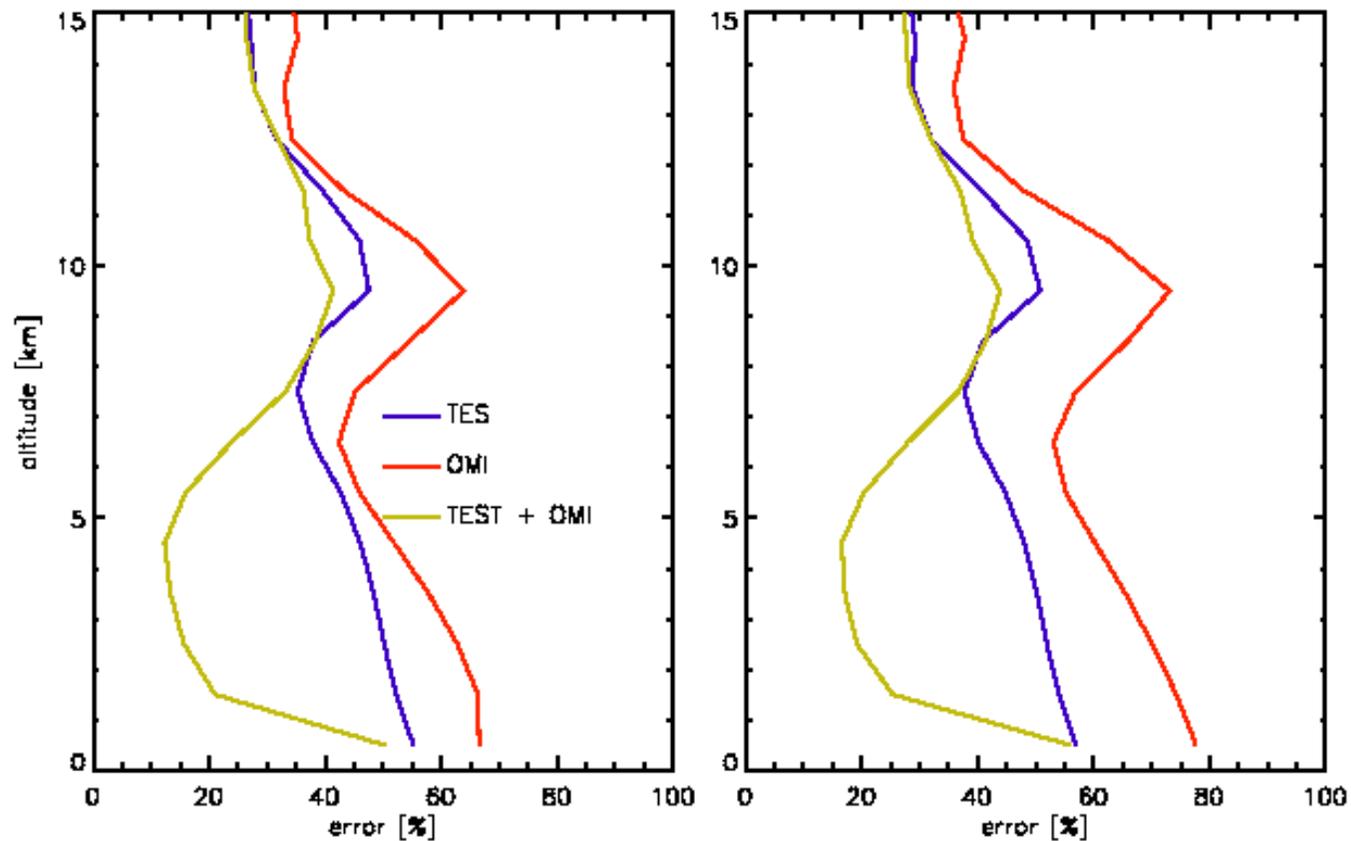
Retrieval error as function of height

UV: shot noise

IR: SNR 500

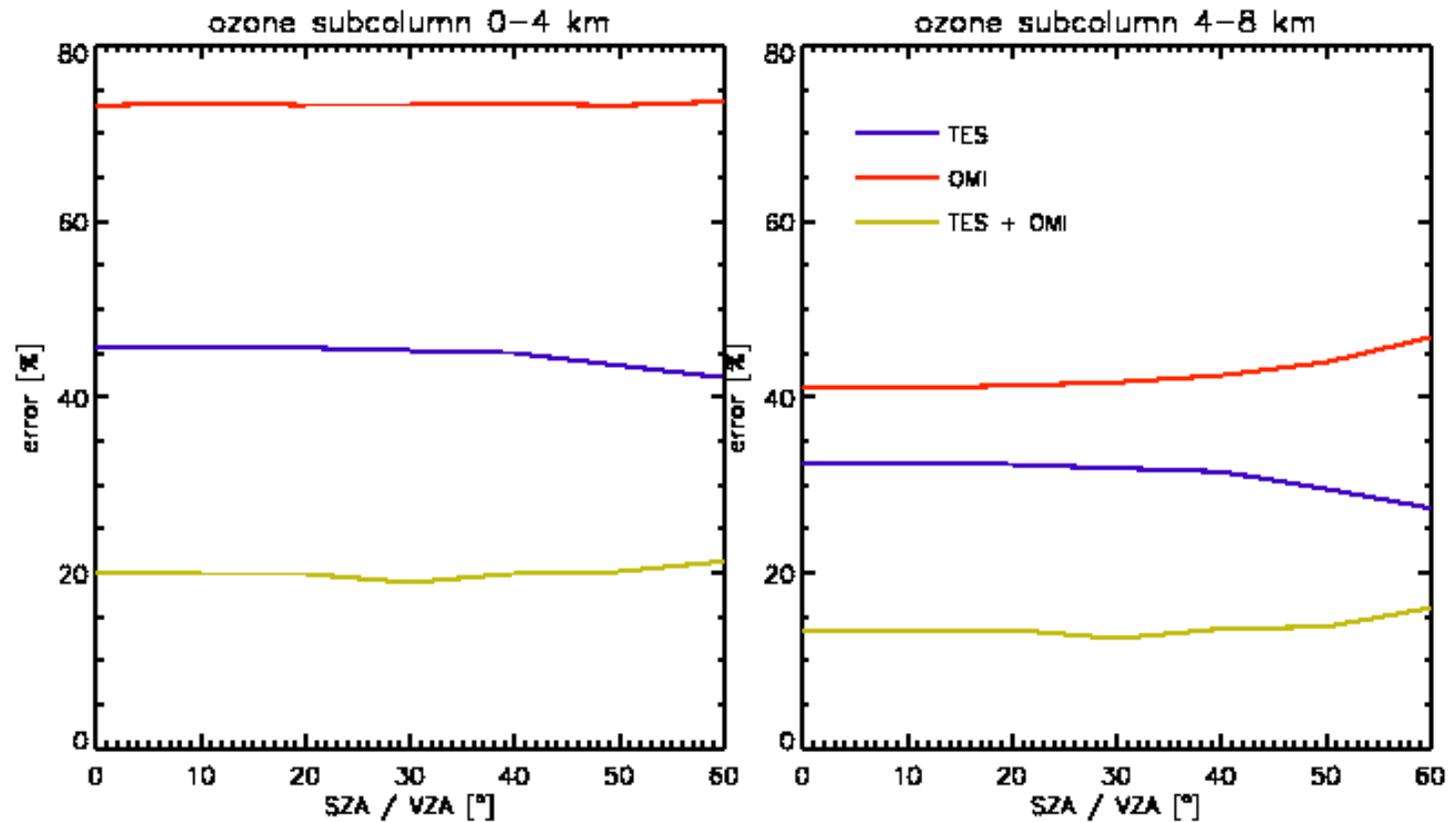
UV: shot noise + 0.4 % nf

IR: SNR 250

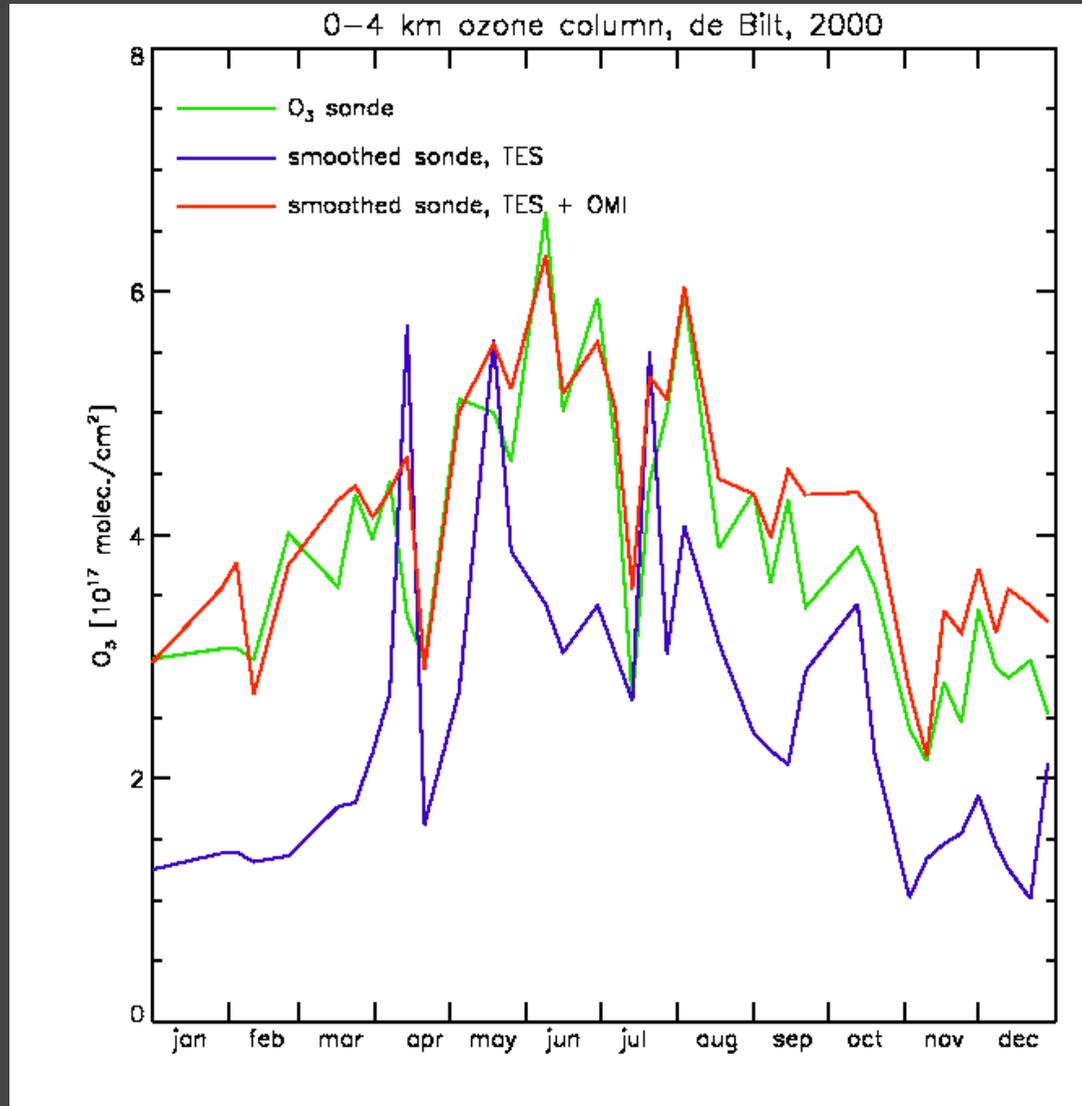


Retrieval error on 0-4 km & 4-8 km ozone column

UV: shot noise + 0.4 % noise floor
IR: 500 SNR



Time series, de Bilt, 2000



Conclusion

- The combination of UV and IR measurements add significant information to ozone in the lower troposphere.
- The combination of co-aligned OMI and TES will allow us to prove this novel concept for the first time.
- In the future also GOME-2 and IASI measurements can be combined.