Sampled databases of 60-level atmospheric profiles from the ECMWF analyses

F. Chevallier (ECMWF)

ABSTRACT:

Two diverse profile datasets from the ECMWF analyses have been made available to the scientific community as part of the NWP SAF project (Eumetsat/ Met Office/ ECMWF/ Météo France).

The potential applications of these databases include statistical regressions and the validation of various models, in particular in the field of radiation (e.g., RTTOV)

They are compared to two other datasets: the previous ECMWF diverse profile dataset, and TIGR-3 from Laboratoire de Météorologie Dynamique (Palaiseau, France).

Characteristics

- The main dataset contains 13,495 profiles that were statistically chosen among 7,000,000 (years 1992 and 1993 from the ECMWF 40-year re-analysis, land+sea, all weather, all latitudes)

- The selection is based on temperature, humidity and ozone criteria (Chevallier et al. 2000)

- A small version of it (80 profiles) exists as well

- Ozone = prognostic + TOMS/SBUV assimilation

- The vertical profiles are described on 60 pressure levels, with top at 0.1 hPa

List of variables

- Date and geographical location
- Land fraction
- Surface pressure/ temperature/ height
- Temperature/ humidity/ ozone profiles
- Cloud cover/ liquid water/ ice water profiles
- Vertical velocity profile
- 2-meter temperature/ humidity
- 10-meter wind
- Surface albedo/ roughness
- Type and cover of low/high vegetation
- 4-layer soil temperature/ humidity
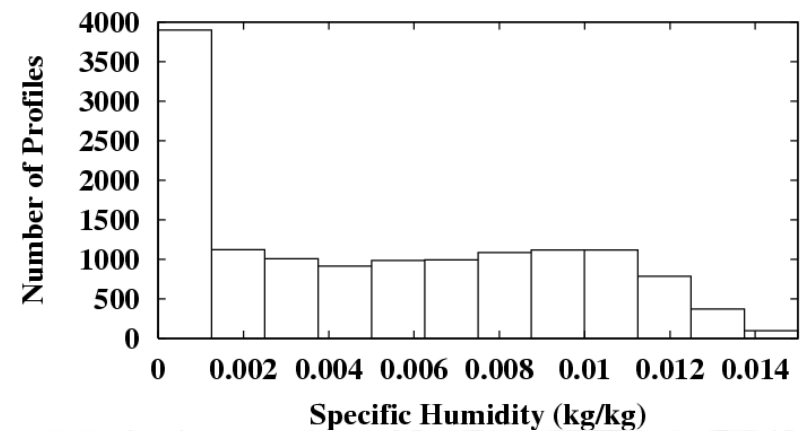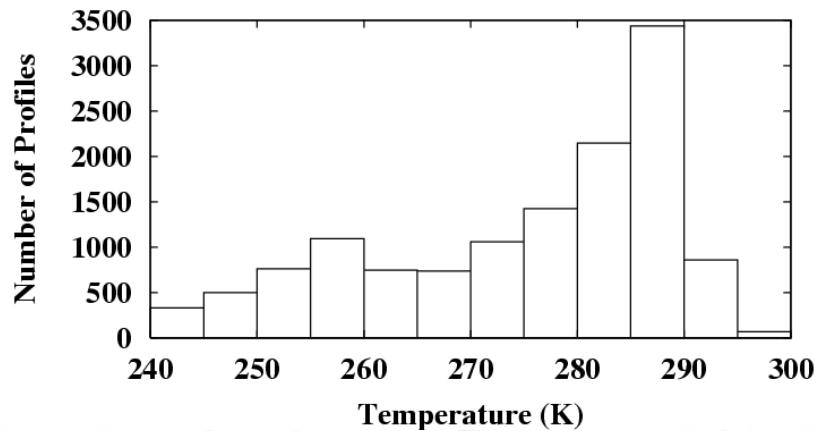- 4-layer ice cover/temperature
- Snow temperature/ depth/ density/ albedo

Example of variable histogram

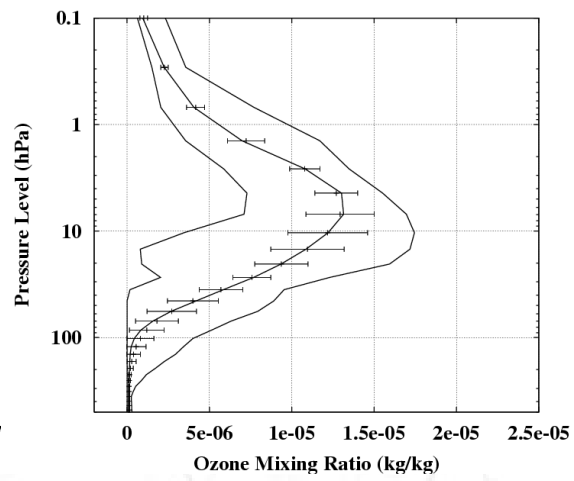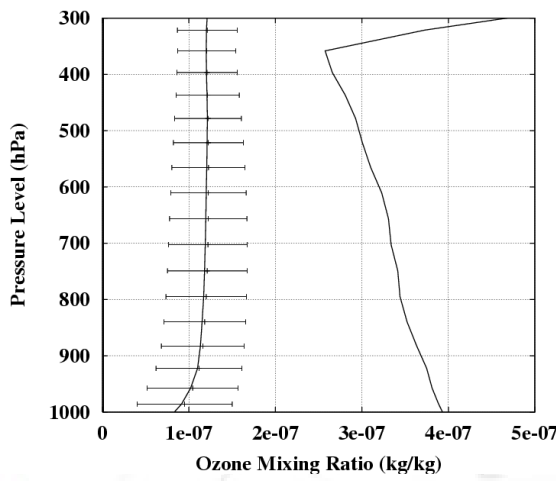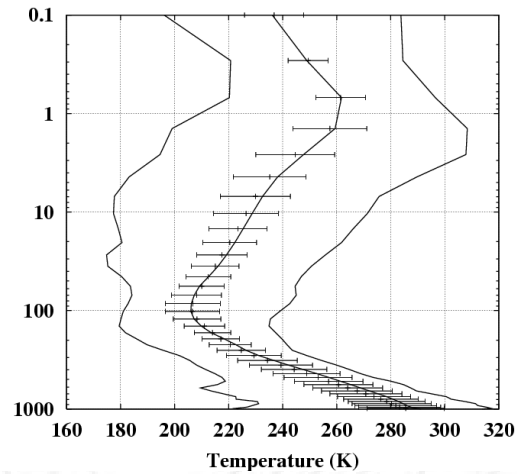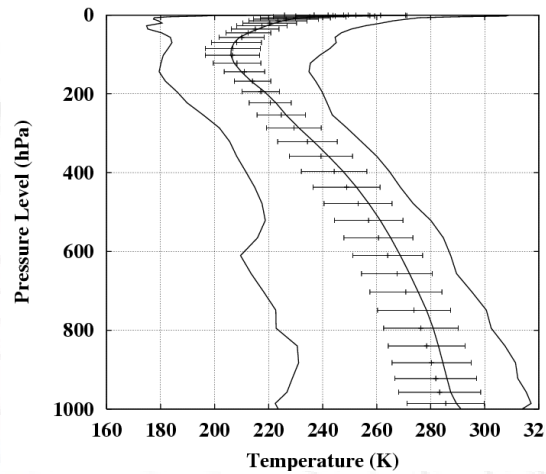ECMWF 60-level diverse profile dataset

13,495-profile dataset

Level 4 hPa
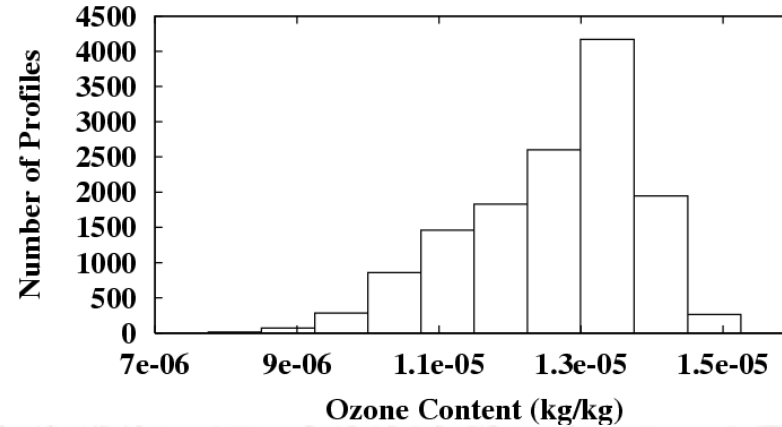
Level 800 hPa
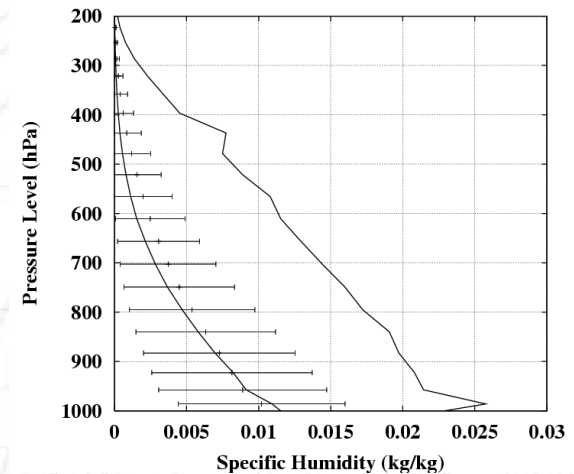
Statistics of the 60-level dataset

13,495-profile dataset
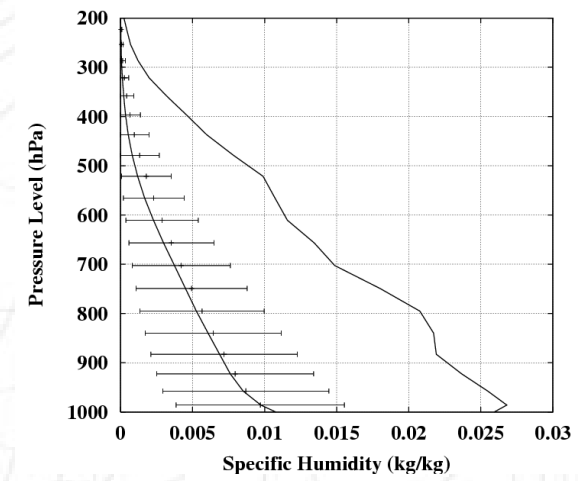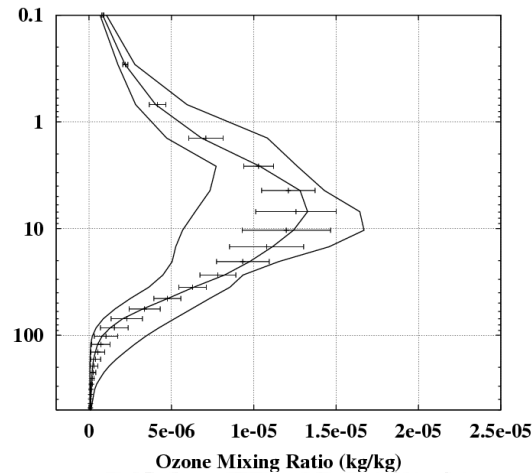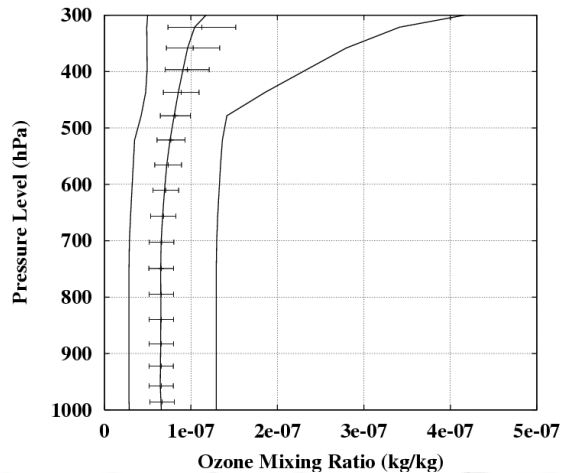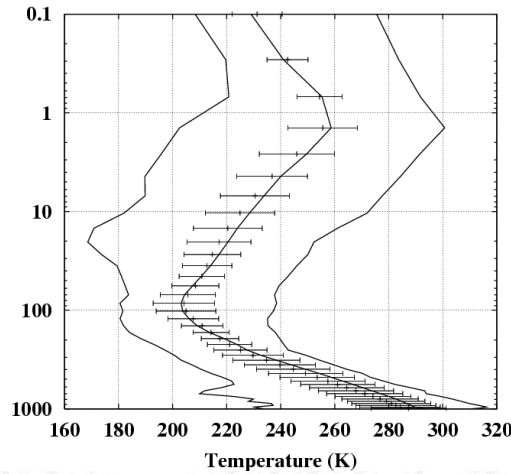
ECMWF 60-level diverse profile dataset
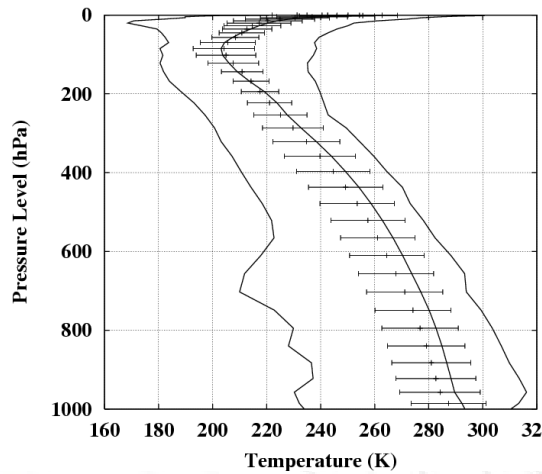

Stats =
Min, Max,
Mean, Std dev.
Median

Statistics of previous 50-level dataset
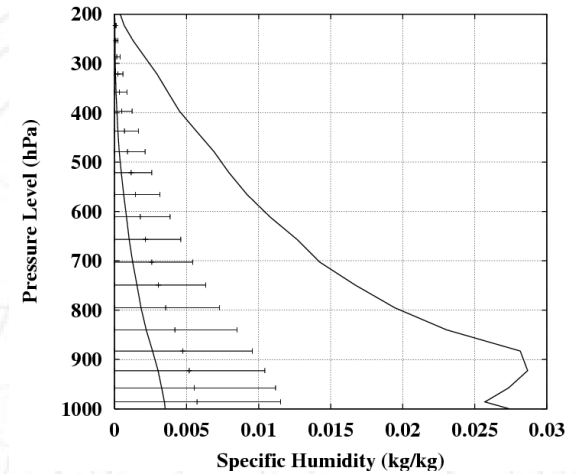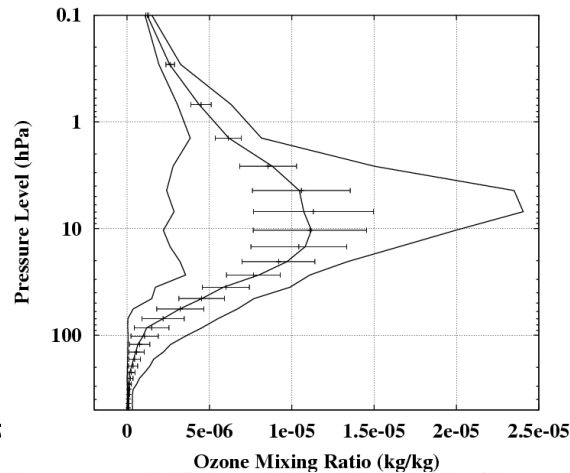
13,766-profile dataset (Chevallier 1999)
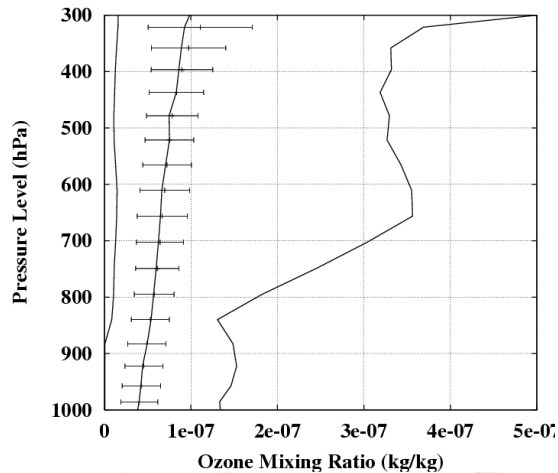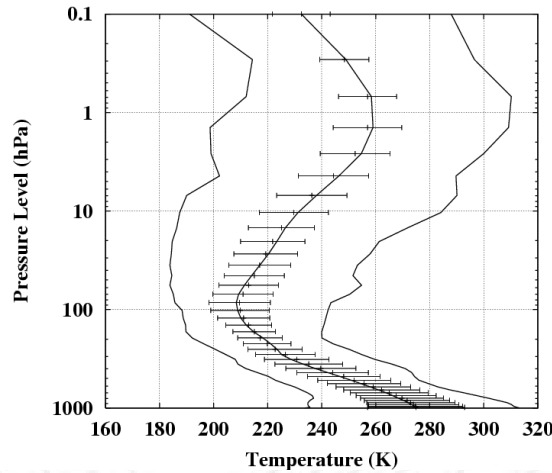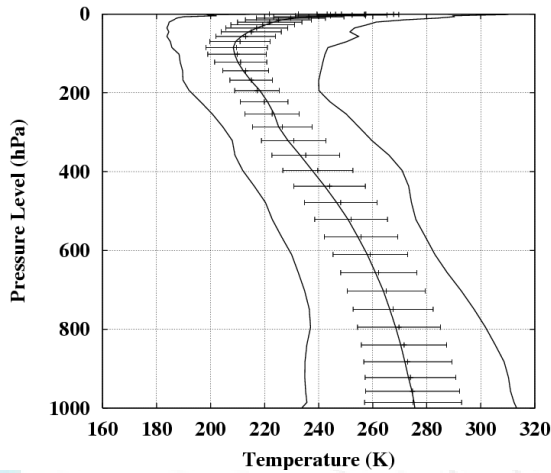
ECMWF 60-level diverse profile dataset

Stats =
Min, Max,
Mean, Std dev.
Median

Statistics of TIGR-3

2311-profile dataset (Chédin et al. 1985; Chevallier et al. 1998)

ECMWF 60-level diverse profile dataset
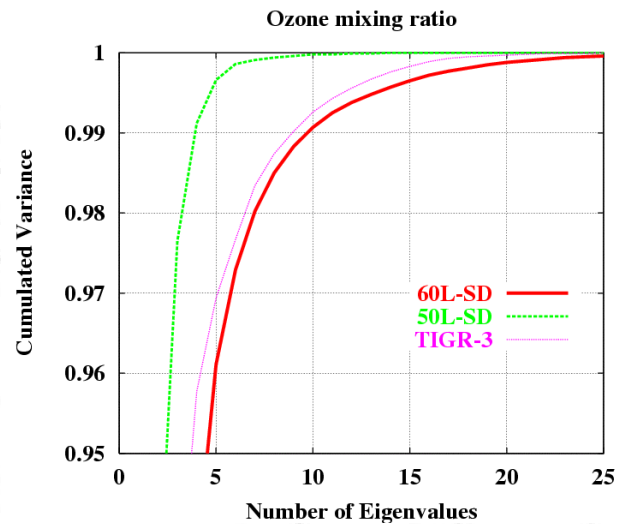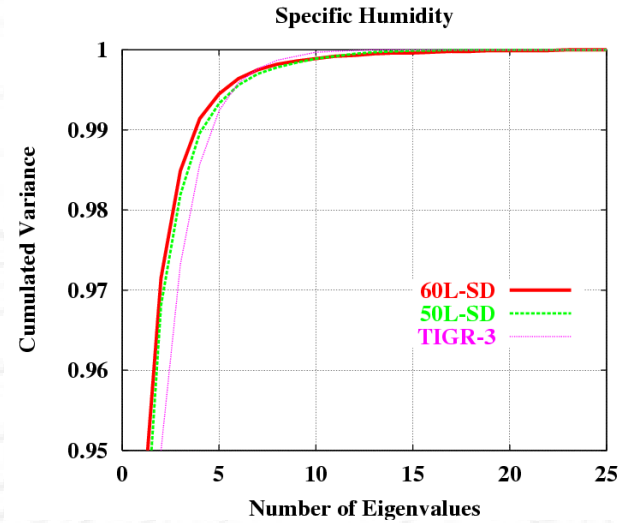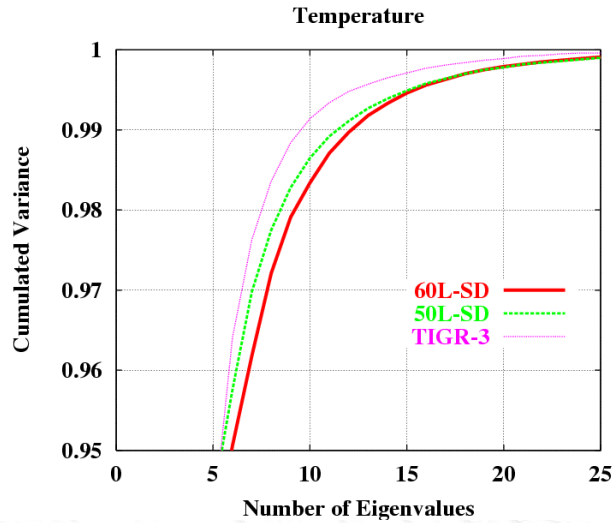
Stats =
Min, Max,
Mean, Std dev.
Median

Vertical resolution

Principal component analysis of the profiles

Availability

❏ 16MB tar file

❏ Free of charge for research applications

❏ Contact: f.chevallier@ecmwf.int

   or NWP SAF

References

✓ Chédin, A., N. A. Scott, C. Wahiche, and P. Moulinier, 1985: The Improved Initialization Method: a high resolution physical method for temperature retrievals from satellites of the TIROS-N series. J. Climate Appl. Meteor., 24, 128-143.

✓ Achard, V., 1991: PhD Thesis, University Paris 6.

✓ Escobar-Munoz, J., 1993: PhD Thesis, University Paris 7.

✓ Chevallier, F., F. Chéruy, N. A. Scott, and A. Chédin, 1998: A neural network approach for a fast and accurate computation of longwave radiative budget, J. Appl. Meteor., 37, 1385-1397.

✓ Chevallier, F., A. Chédin, F. Chéruy, and J.-J. Morcrette, 2000: TIGR-like atmospheric profile databases for accurate radiative flux measurements, Q. J. R. Meteor. Soc., 126, 777-785.

✓ Chevallier, F., 1999: TIGR-like sampled databases of atmospheric profiles from the ECMWF 50-level forecast model, NWP SAF Report No. NWPSAF-EC-TR-001, 18 pp.

✓ Chevallier, F., 2002: Sampled databases of 60-level atmospheric profiles from the ECMWF analyses, NWP SAF Report No. NWPSAF-EC-TR-004, 27 pp.

ECMWF 60-level diverse profile dataset