REPORT ABOUT ENVISAT GOMOS NRT PRODUCTS (GOM_RR__2P) FOR APRIL 2011

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May 9, 2011

1. Key points for April 2011

- The data volume received in April was substantially lower than that received in March 2011. In particular, the ozone data amount was reduced to 50% of that received in March; while the water vapour volume only accounted for 10% of the data amount received in March.
- The mean ozone first guess and analysis departures were typically between $\pm$10% at most levels (0.4 hPa $<$p$<$ 40 hPa) and available latitudes. Larger departures were normally found in the lower stratosphere (p$>$ 40 hPa). The standard deviations of the departures were larger than 5% at all levels and latitudinal bands, values larger than 50% were found in places.
- The comparisons between the GOMOS water vapour retrievals and the ECMWF water vapour first guess and analyses showed a generally poor level of agreement as discussed in the last few months. GOMOS water vapour observations were from one to four orders of magnitude larger than their model equivalent at most vertical levels and latitudes. However, the number of GOMOS water vapour observations was generally too low to be statistically significant.
- The monitoring statistics for April were produced with the operational ECMWF model, CY36R4.

2. Quality and amount of received data

Data coverage and amount of received data during April 2011 are shown in figures 1 and 2 in the ozone and water vapour reports. Overall, up to 1543 data were available for ozone and up to 53 (good) observations were delivered for water vapour. This value represents a reduction to 50% and 10% the amount of ozone and water vapour observations received in March 2011, respectively. The largest number of observations were sampled in the mid stratosphere (see figure 3 in the attached water vapour and ozone reports). There were no observations at high latitudes in the northern hemisphere. The water vapour observations were all retrieved in the tropics and at high latitudes in the southern hemisphere. However, only a small amount of water vapour data was available at some levels, so that here the results might not be statistically significant. Nonetheless they are summarized below for completeness.

3. GOMOS ozone data

The profile plots (ozone report: Figures 3-7) show that both the ozone first guess and analyses were within the observation one-standard deviation range at all levels and latitudinal bands.

In the global mean and in the average over the midlatitudes in the southern hemisphere, the first-guess departures were within -5 and +10% at most vertical levels in the stratosphere and in the mesosphere (0.4 hPa $<p<$ 40 hPa). In the tropics, the ozone residuals were within -15 and +10% for pressure levels smaller than 40hPa. At high latitudes in the SH, the first guess and analysis departures were typically within -12 and +5% at most vertical levels in the stratosphere and mesosphere. Larger departures ($>$50% in places) were found in the lower stratosphere (typically p$>$ 40 hPa) and at some mesospheric levels at high latitudes in the SH.

The standard deviations of the analysis and first guess departures were larger than 10% at all levels and latitudinal bands, exceeding 50% in the upper stratosphere and mesosphere.

The scatter plots (ozone report: Figures 7-14) generally confirm the above analysis. Large scatter was still found in the GOMOS ozone observations at mesospheric levels that led to a large scatter in the first-guess departures.

The timeseries of GOMOS ozone and departures (ozone report: Figure 15-18) and the Hovmoeller plots (ozone report: Figure 19-20) also confirm the level of agreement between NRT GOMOS ozone retrievals and the ECMWF ozone analyses discussed above.

4. Water vapour data

The level of agreement between the GOMOS water vapour profiles and the corresponding ECMWF water vapour first guess and analyses is generally comparable with that discussed in the last few months. The profile plots (Water Vapour report: Figures 3-4) show that the GOMOS water vapour values were from one to four orders of magnitude larger than those given by the model at most vertical levels and all available latitudinal bands, with the model being drier than the GOMOS observations. Some improvements were found in the stratosphere (p $>$ 10 hPa) in the tropics, where the differences between the GOMOS observations and their model equivalent were of the same order of magnitude. However, it should be noted that the water vapour data volume was very low at all levels and available latitudinal bands, so that the results are unlikely statistically significant.

The scatter plots (water vapour report: Figures 5-10) confirm the above analysis. Where data were available, they showed large scatter at all vertical levels and available latitudes that led to large scatter in the first guess departures. The Hovmoeller plots and the timeseries (not presented) of GOMOS water vapour and departures show no signal as a consequence of the combination of low number of data and their poor quality.

5. Remarks

This monitoring report was produced with the operational ECMWF model (CY36R4). Ozone layers from SBUV/2 on NOAA-17 and NOAA-18, SCIAMACHY total column ozone (produced by KNMI), and OMI total column ozone were actively assimilated. MERIS total column water vapour (TCWV) was also assimilated since September 2009.

A variational bias correction for retrieved products became operational in September 2009 in the ECMWF model CY35R3. All the assimilated ozone products (with the only exception of the SBUV/2 data) and the MERIS TCWV were bias corrected.

The results presented in this reports made use of only the observations acquired in dark-limb conditions as implemented in the PDS2BUFR converter in May 2007.

All ozone values are in Dobson Units (DU), and water vapour partial columns are in mg/m^2.

REPORT ABOUT ENVISAT GOMOS NRT OZONE DATA (GOM_RR__2P) FOR APRIL 2011

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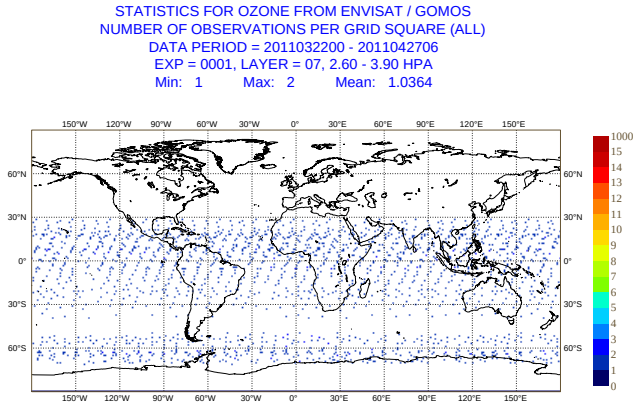


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT ozone data for layer 7 (2.60-3.90 hPa) for April 2011.

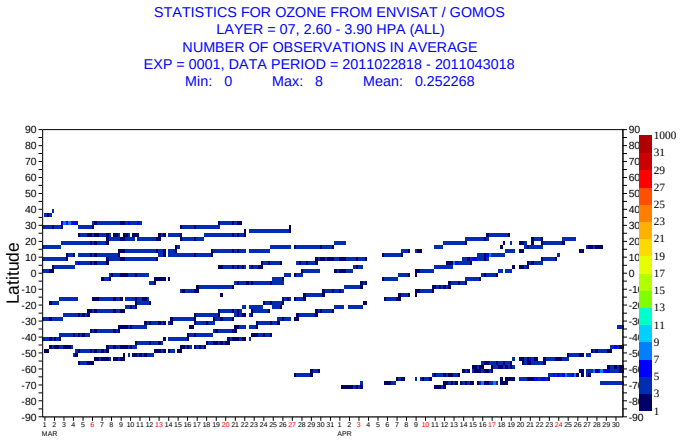


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT ozone data per 6-hour cycle for layer 7 (2.60-3.90 hPa) for March-April 2011.

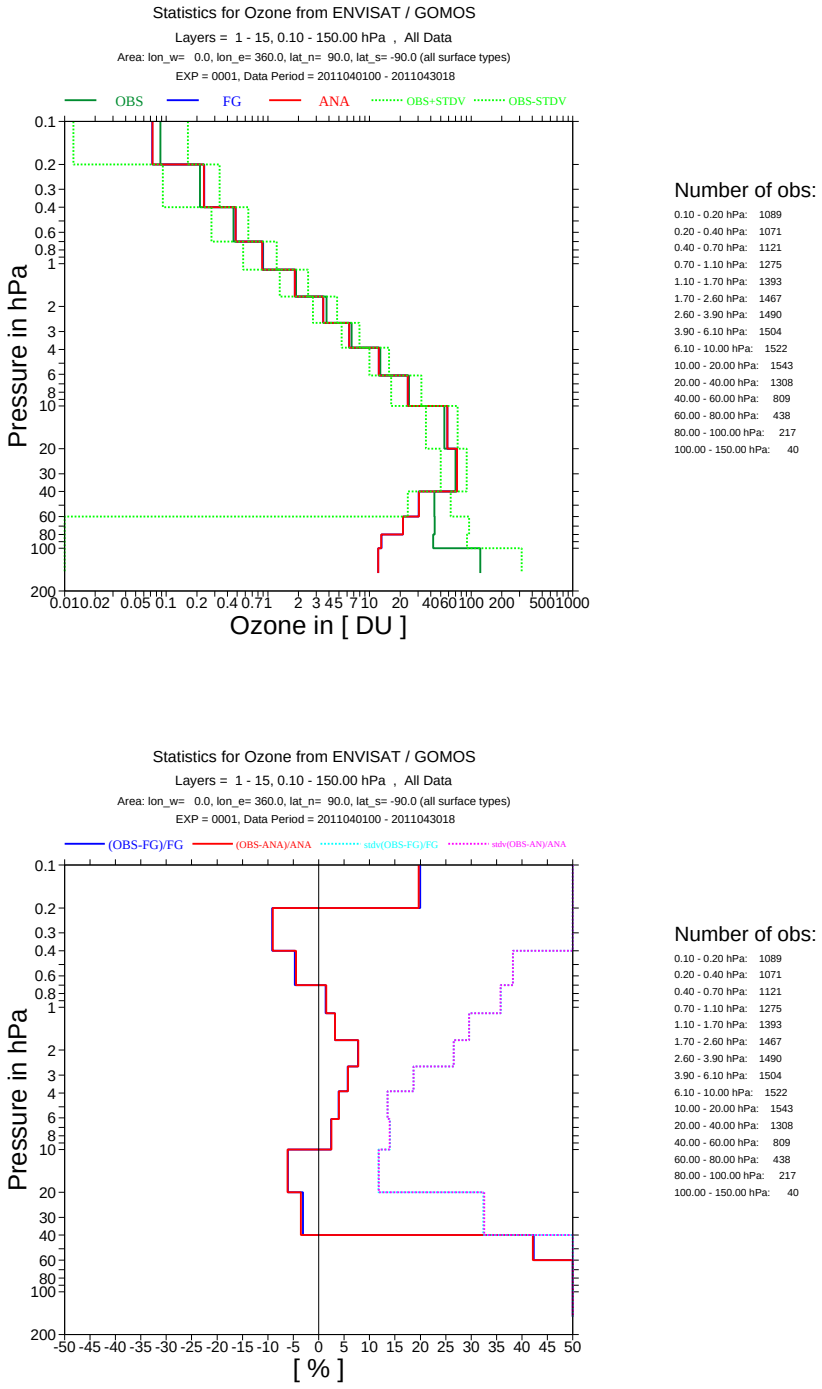
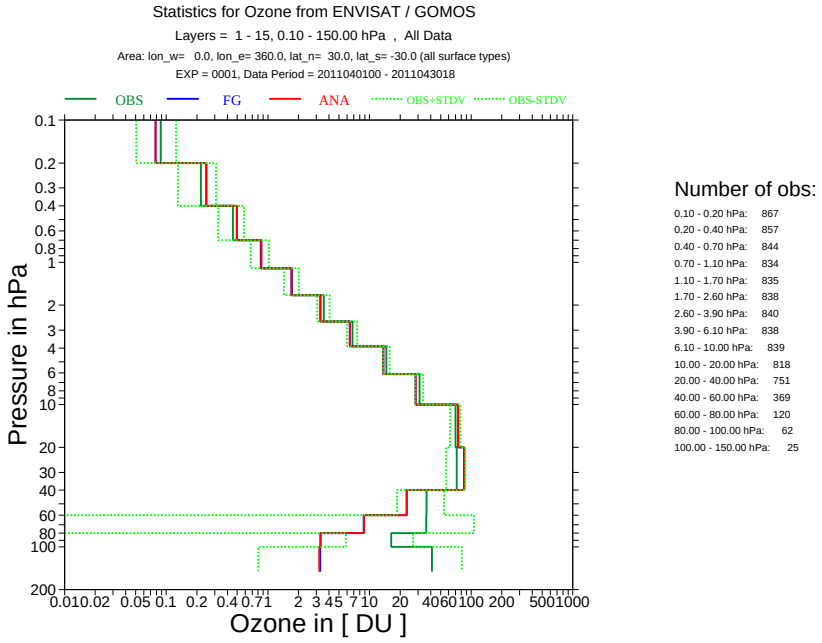


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT ozone data in DU for April 2011 (global mean). The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (red), and the mean observation (green) +/- 1 standard deviation (green dotted lines). The bottom plot shows the departures and the standard deviation of the departures in %. Plotted are the partial columns for the 15 layers listed to the right of the diagrams.



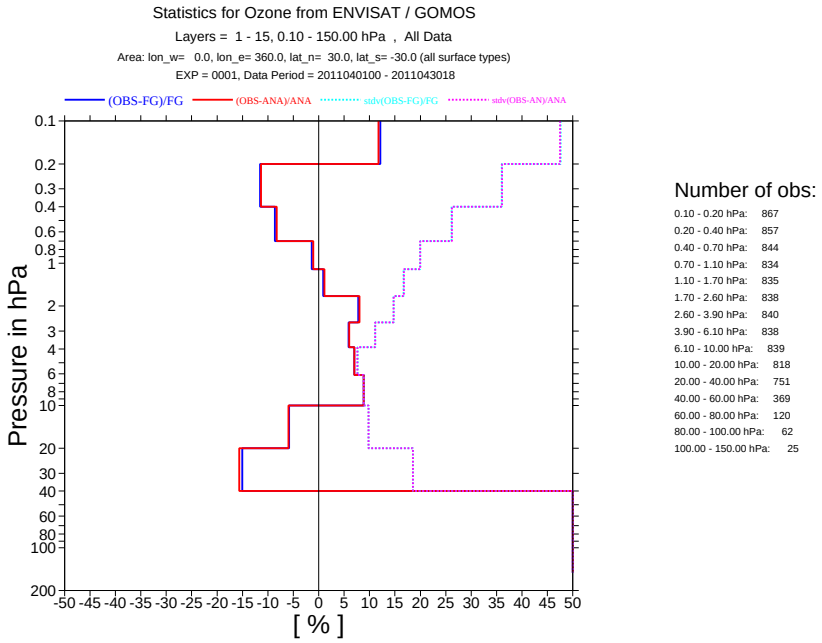
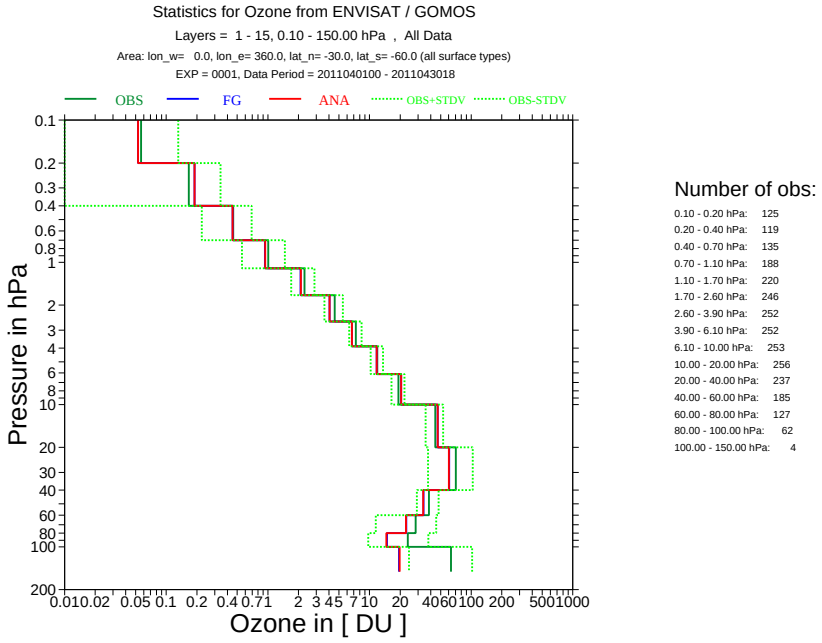


Fig. 4. As Fig. 3 but for 30N-30S.



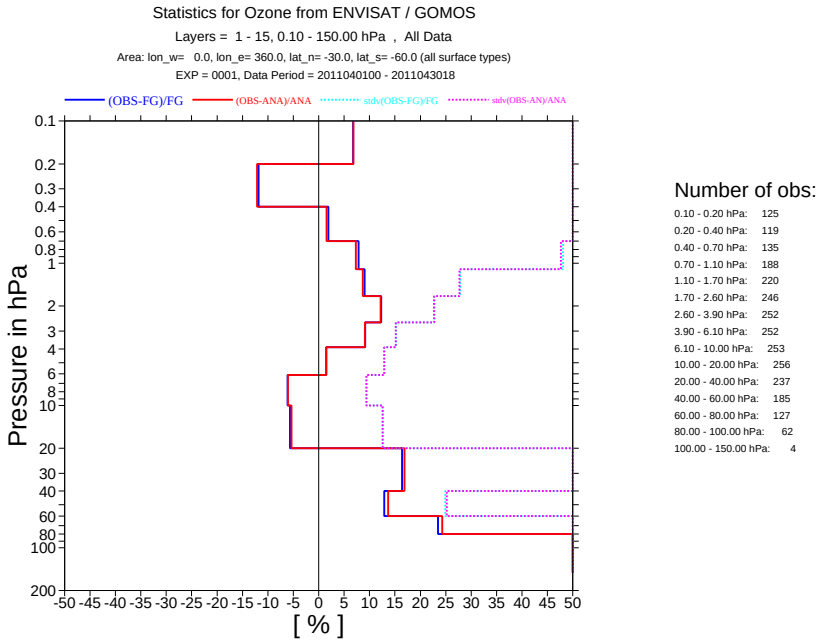
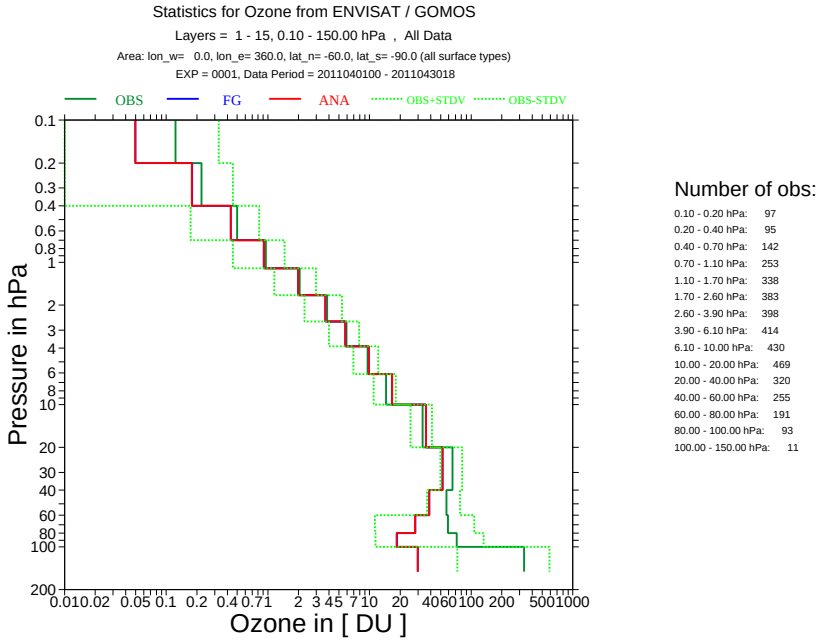


Fig. 5. As Fig. 3 but for 30S-60S.



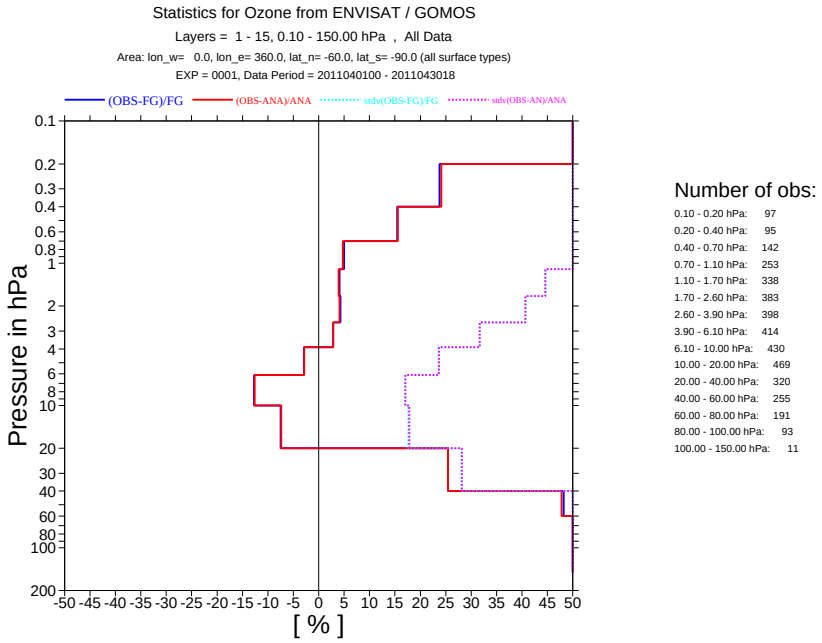


Fig. 6. As Fig. 3 but for 60-90S.

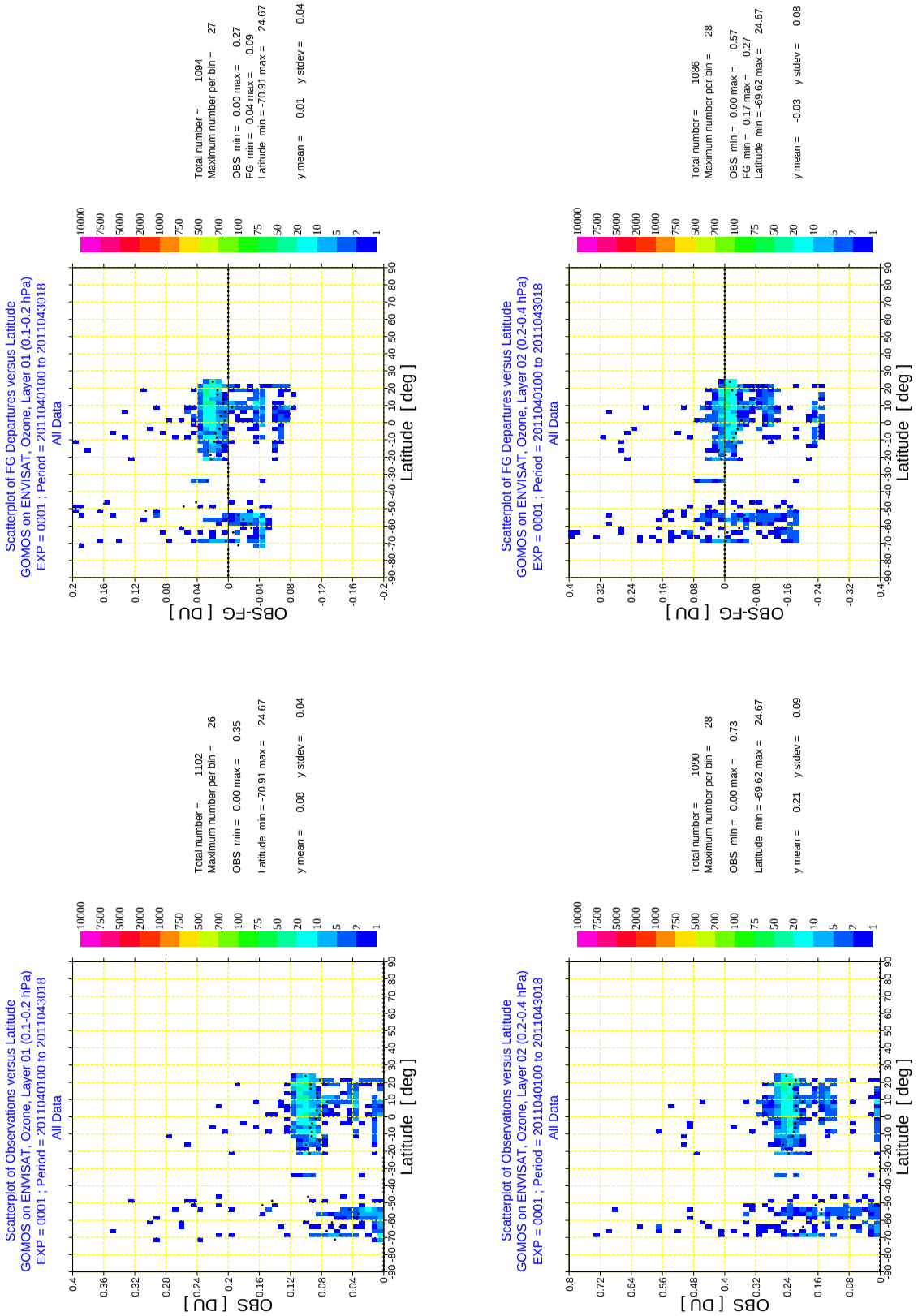


Fig. 7. Scatter plot of ENVISAT GOMOS NRT ozone data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT ozone data against latitude (right) for April 2011 for layer 1 (0.1-0.2 hPa) and layer 2 (0.2-0.4 hPa). The colours show the number of data per bin, the black dots the mean value per bin.

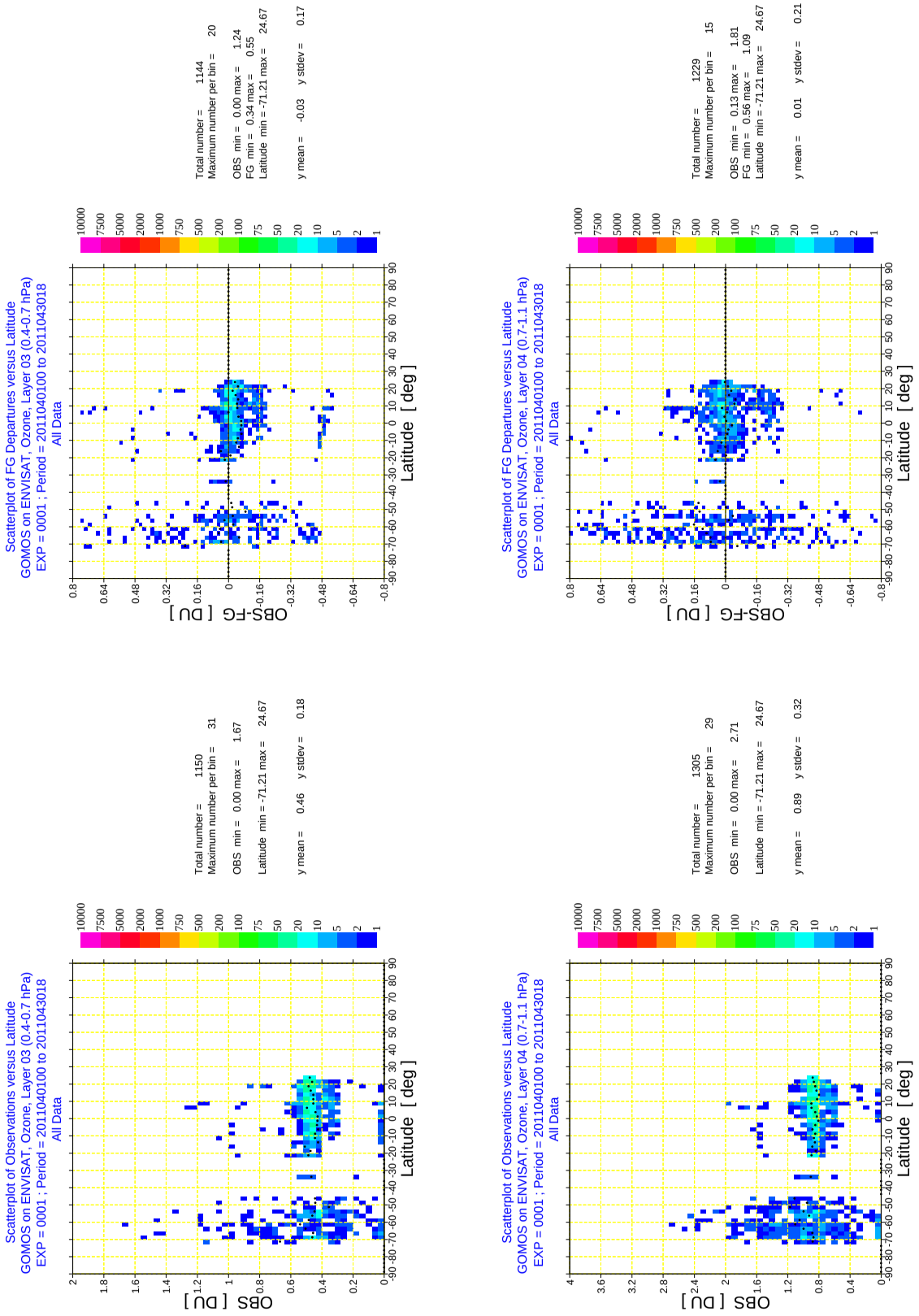


Fig. 8. As Fig. 7 but for layer 3 (0.4-0.7 hPa) and layer 4 (0.7-1.1 hPa).

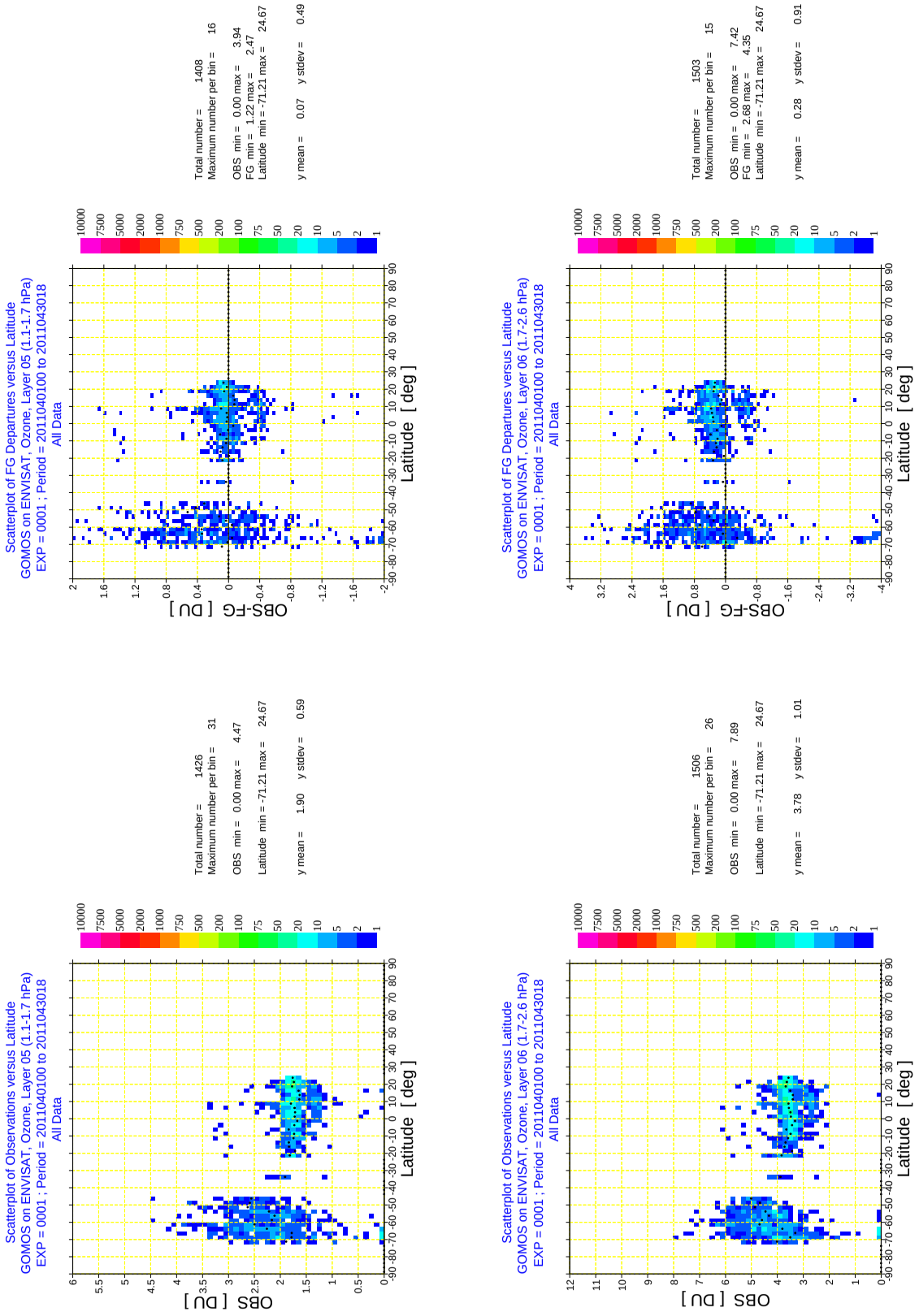


Fig. 9. As Fig. 7 but for layer 5 (1.1-1.7 hPa) and layer 6 (1.7-2.6 hPa).

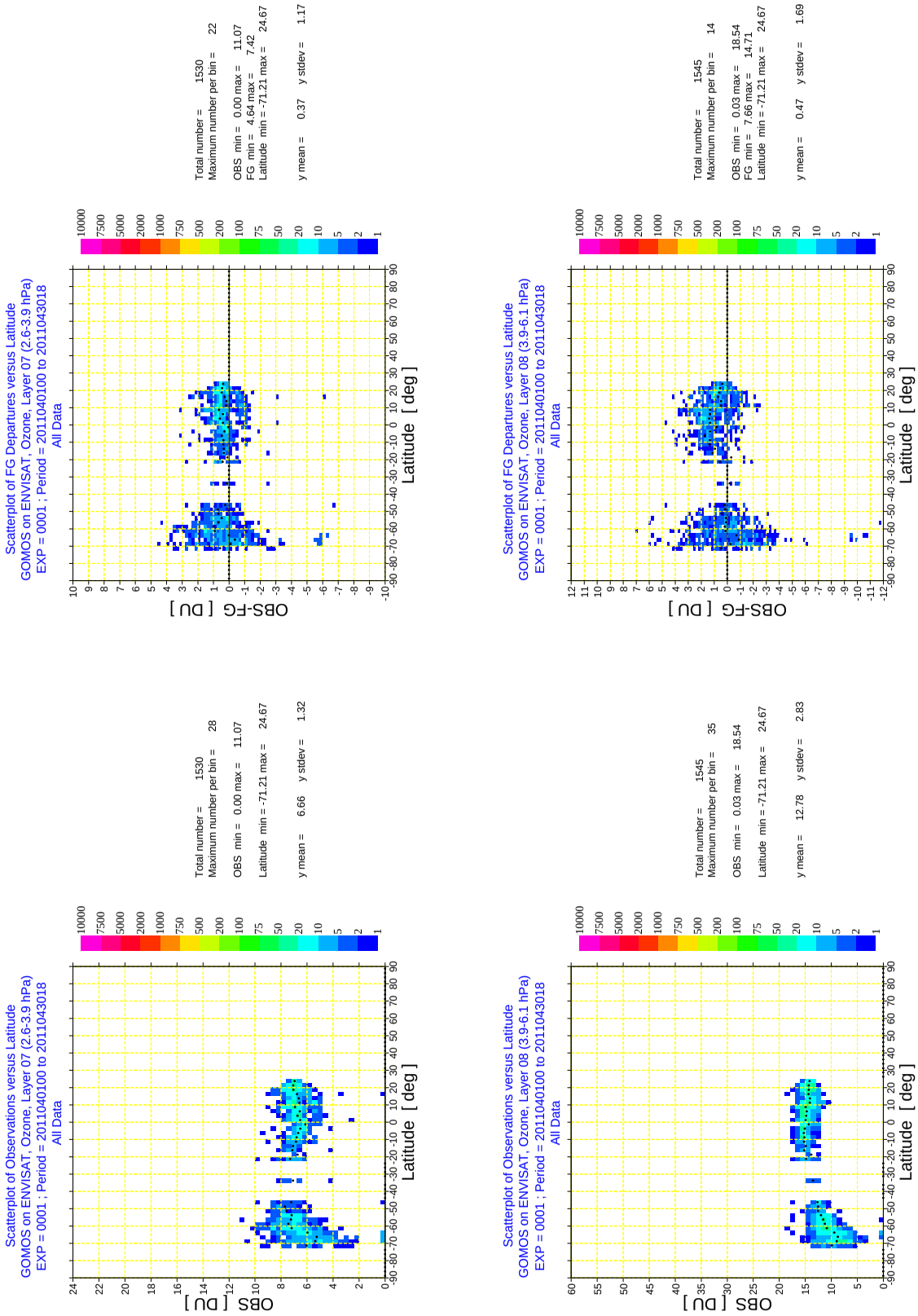


Fig. 10. As Fig. 7 but for layer 7 (2.6-3.9 hPa) and layer 8 (3.9-6.1 hPa).

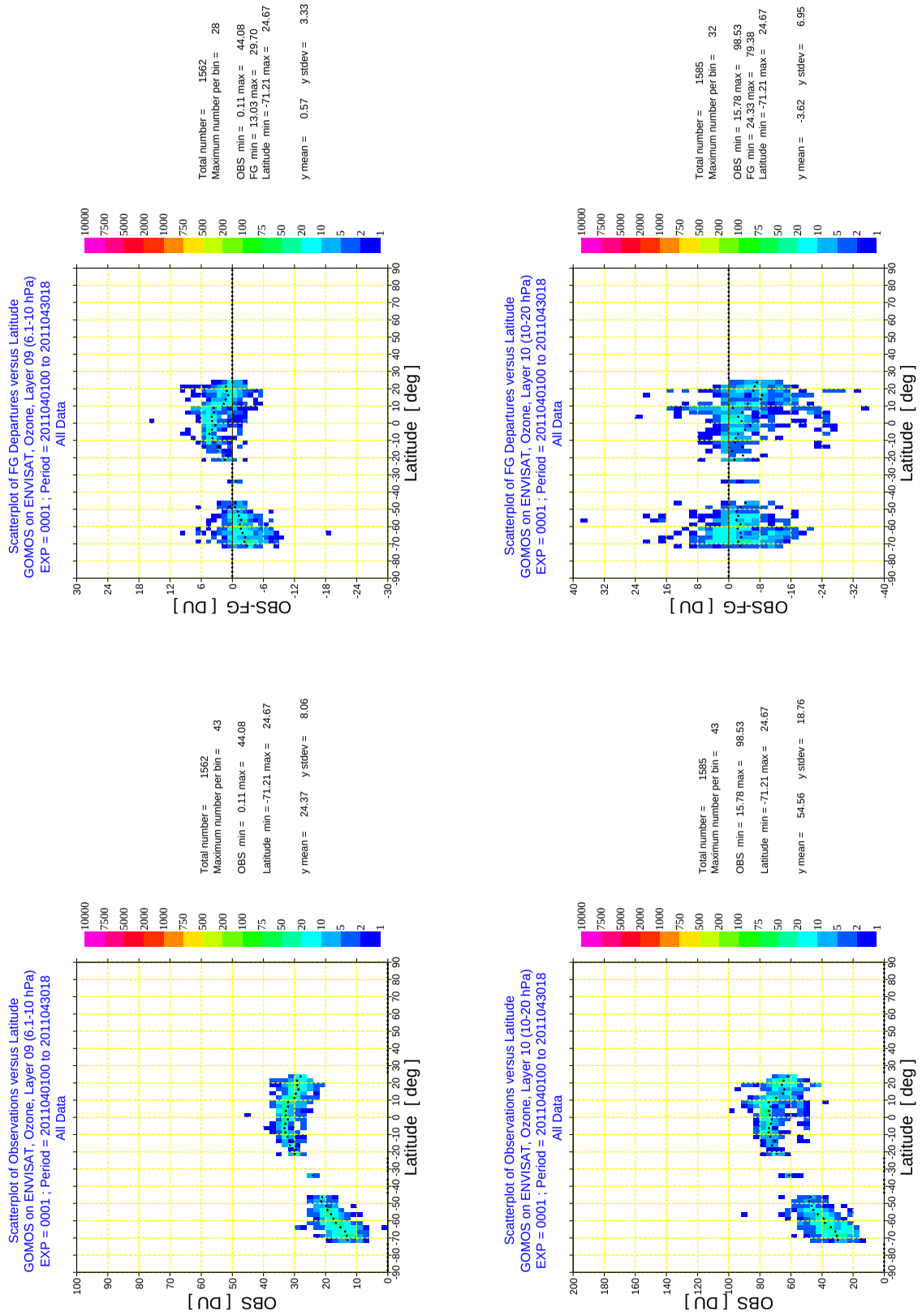


Fig. 11. As Fig. 7 but for layer 9 (6.1-10 hPa) and layer 10 (10-20 hPa).

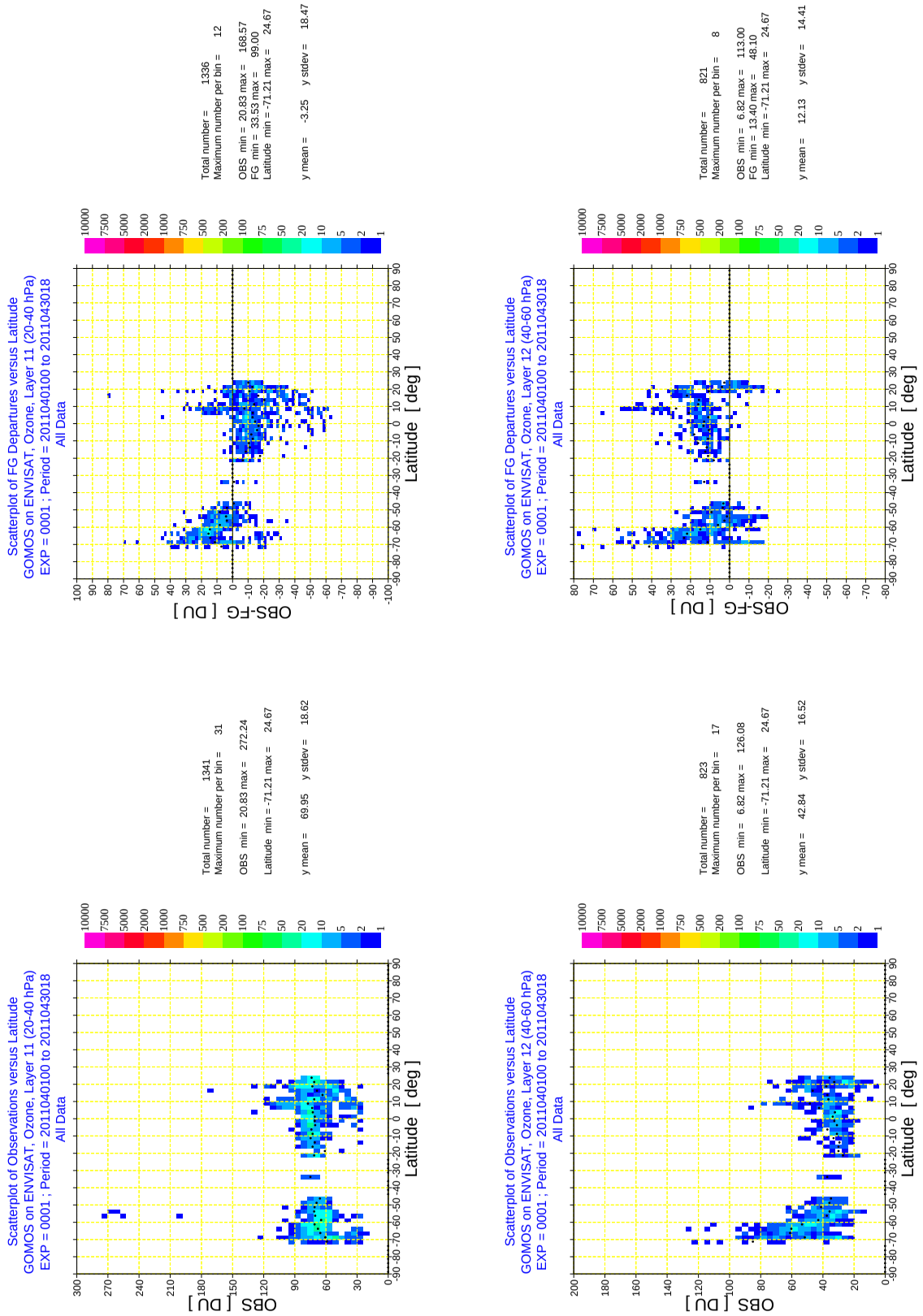


Fig. 12. As Fig. 7 but for layer 11 (20-40 hPa) and layer 12 (40-60 hPa).

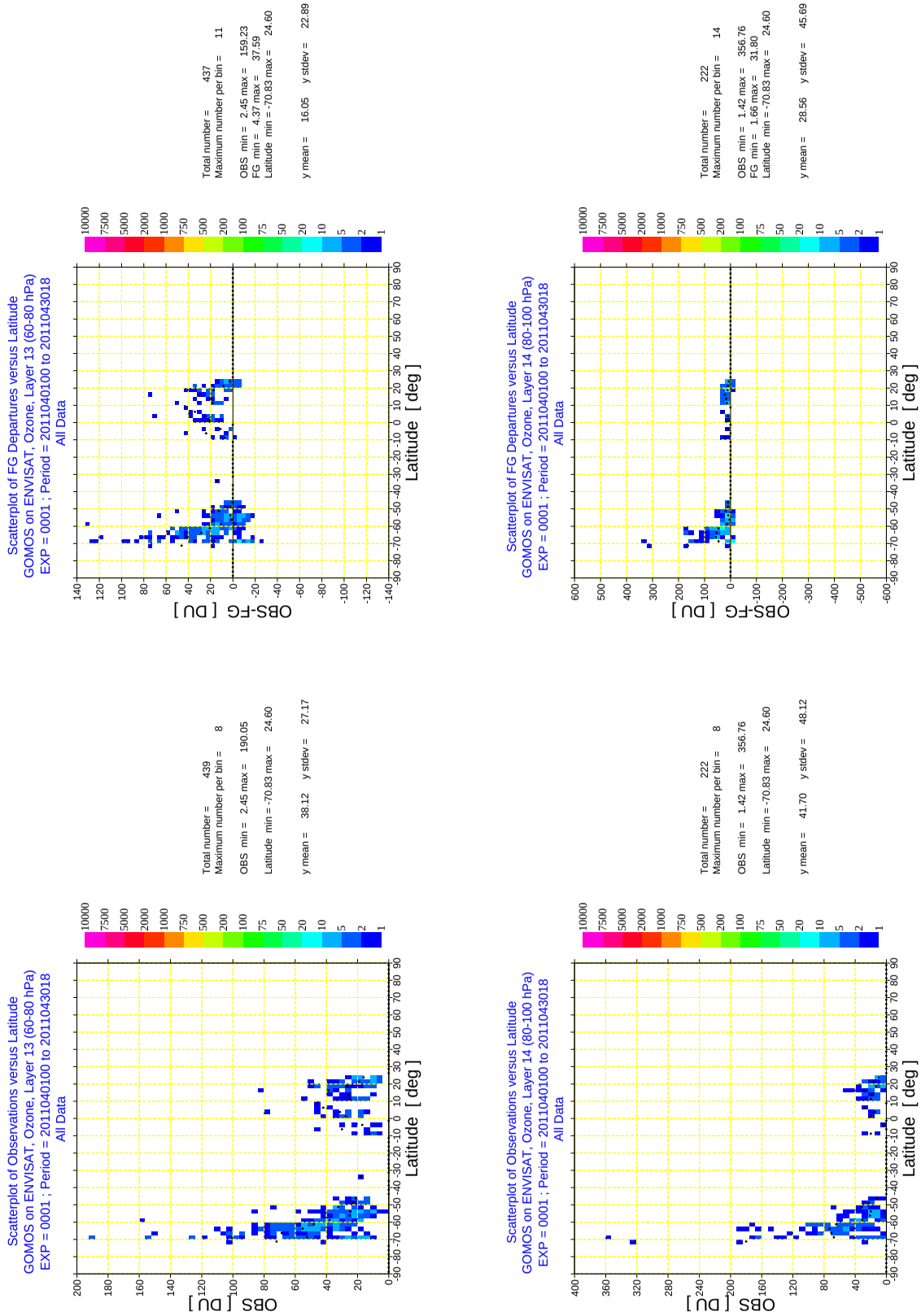


Fig. 13. As Fig. 7 but for layer 13 (60-80 hPa) and layer 14 (80-100 hPa).

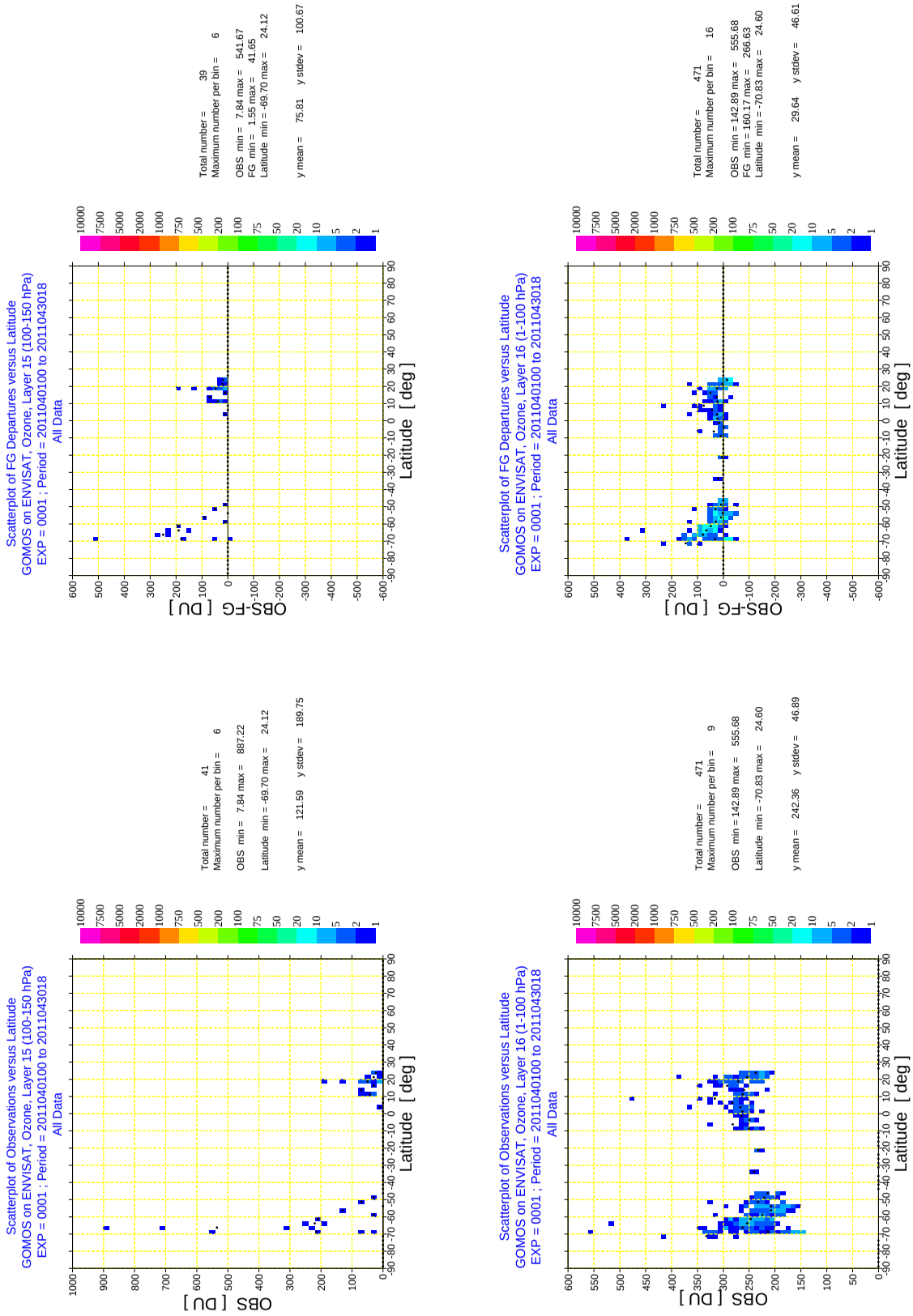


Fig. 14. As Fig. 7 but for layer 15 (100-150 hPa) and layer 16 (1-100 hPa).

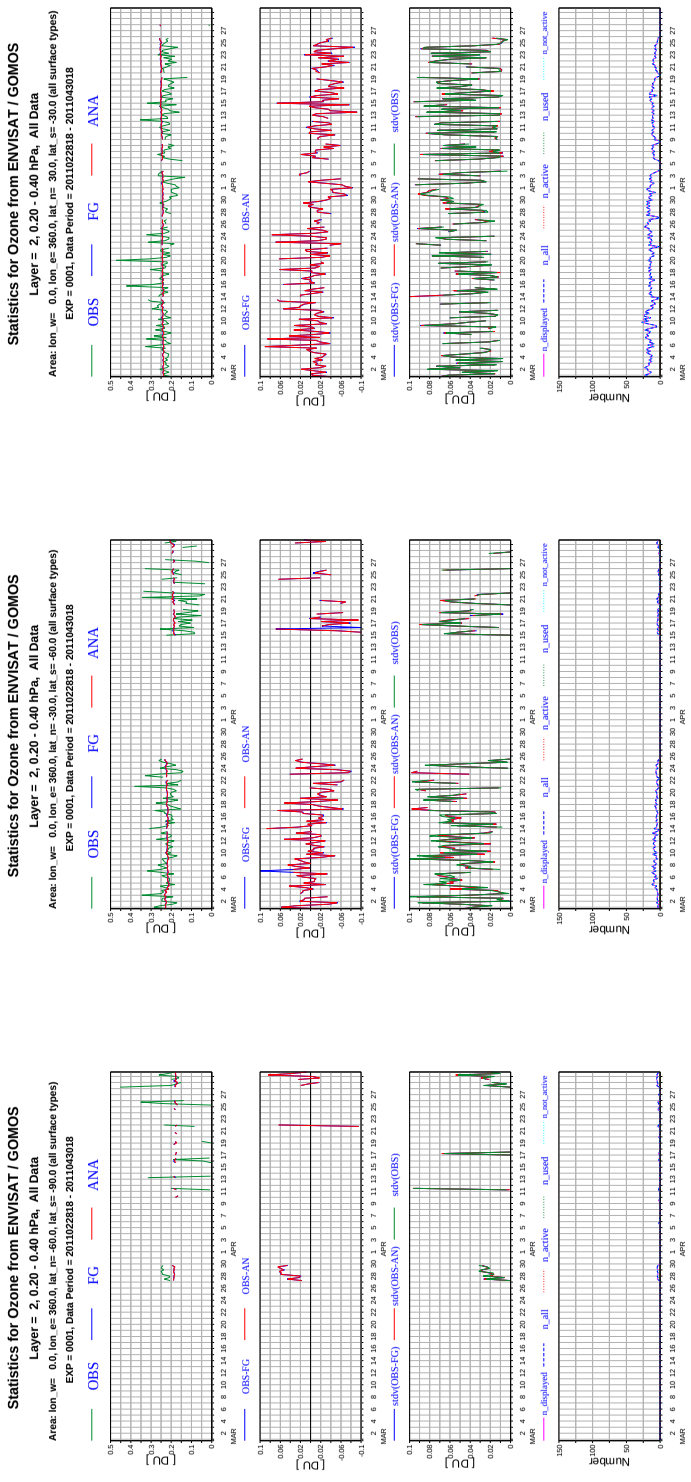


Fig. 15. Timeseries of mean ENVISAT GOMOS NRT ozone data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for layer 2 (0.2-0.4 hPa) 30N-30S, 30-60S, and 60-90S for the period March-April 2011.

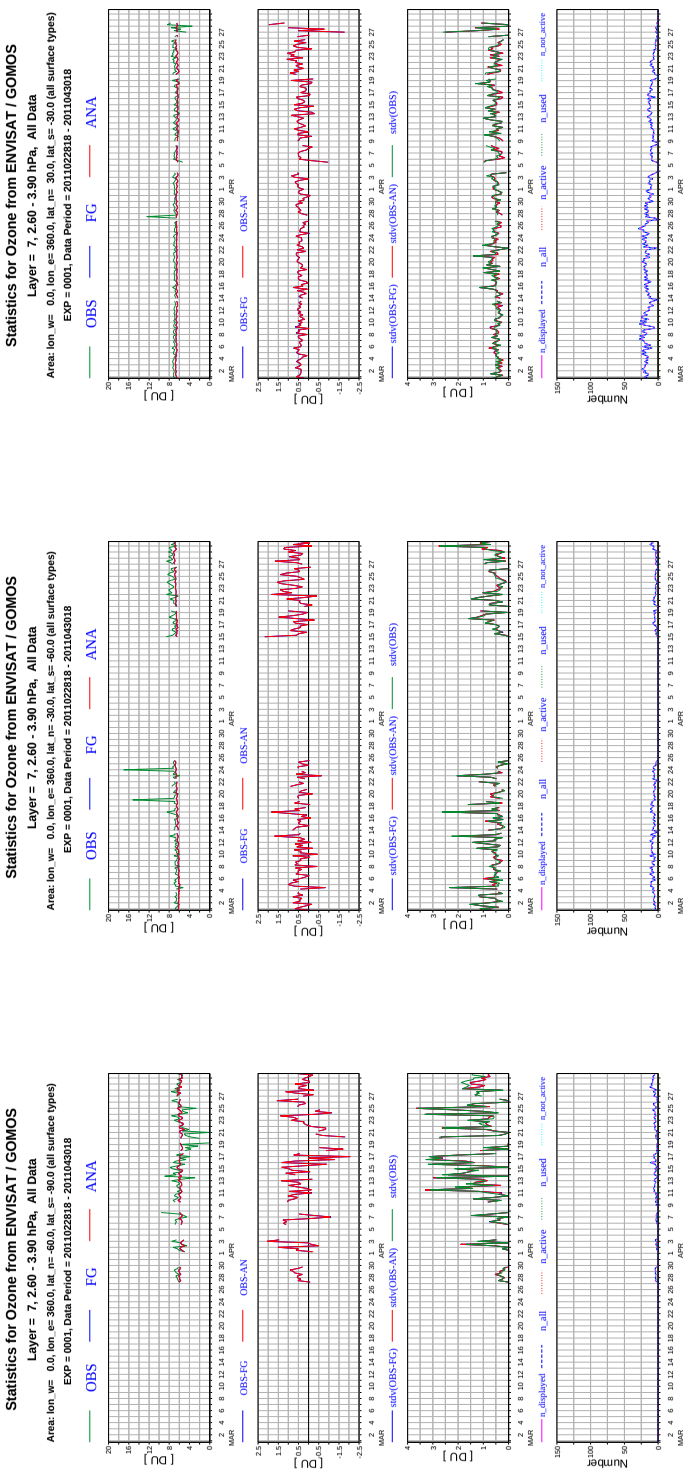


Fig. 16. As Figure 15, but for layer 7 (2.6-3.9 hPa).

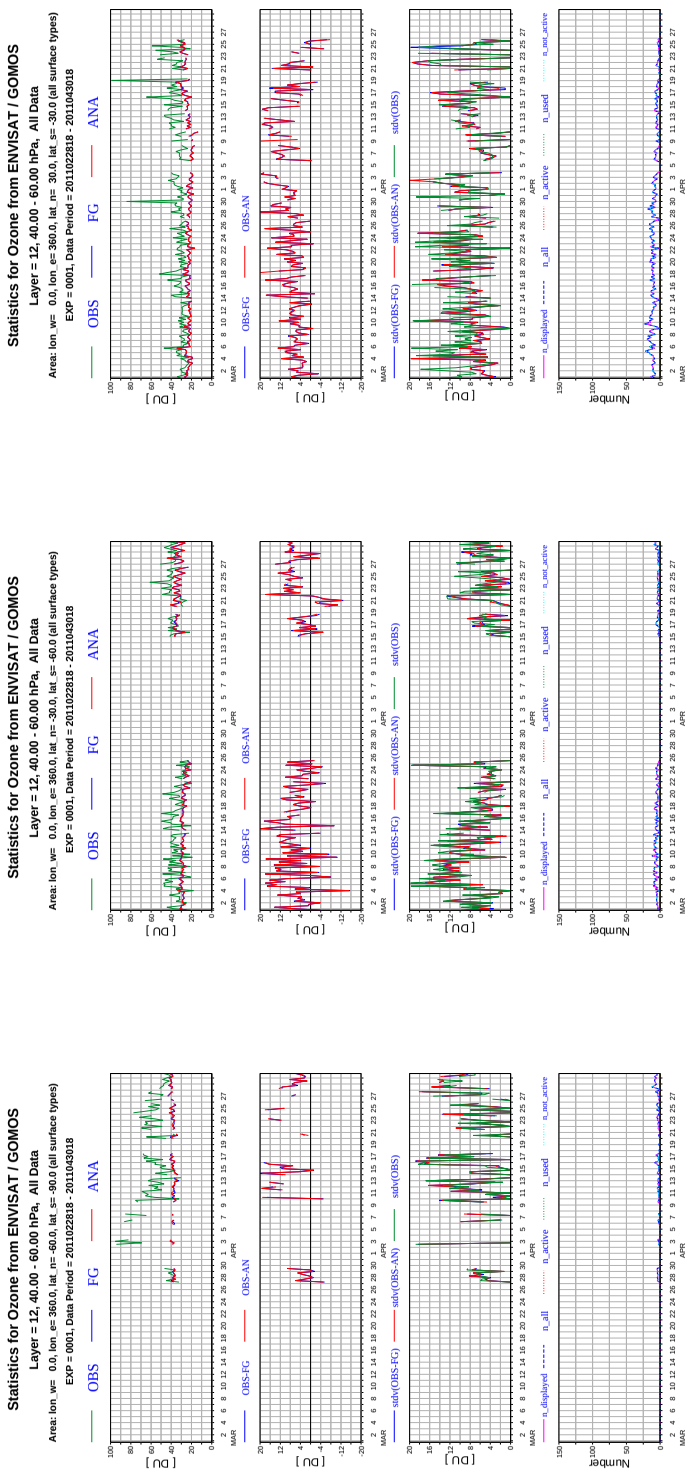


Fig. 17. As Figure 15, but for layer 12 (40-80 hPa).

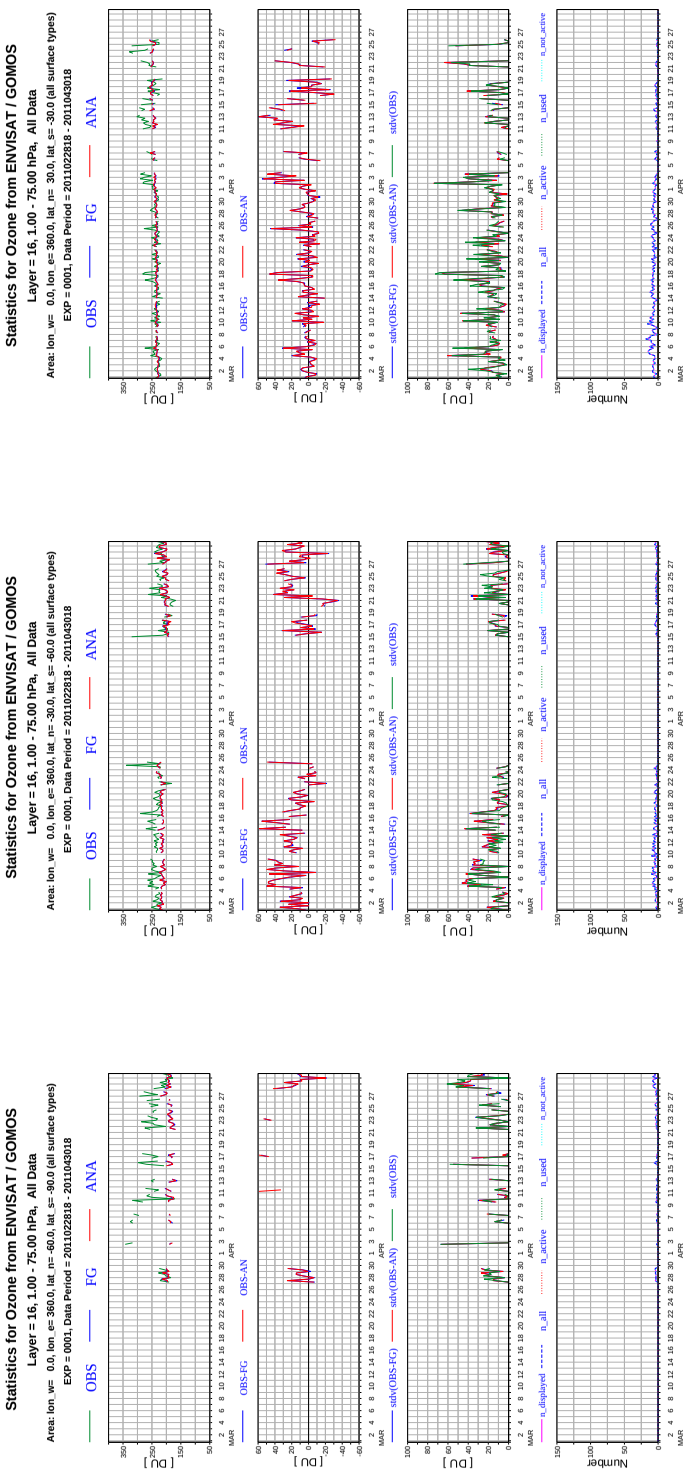


Fig. 18. As Figure 15, but for layer 16 (1-100 hPa).

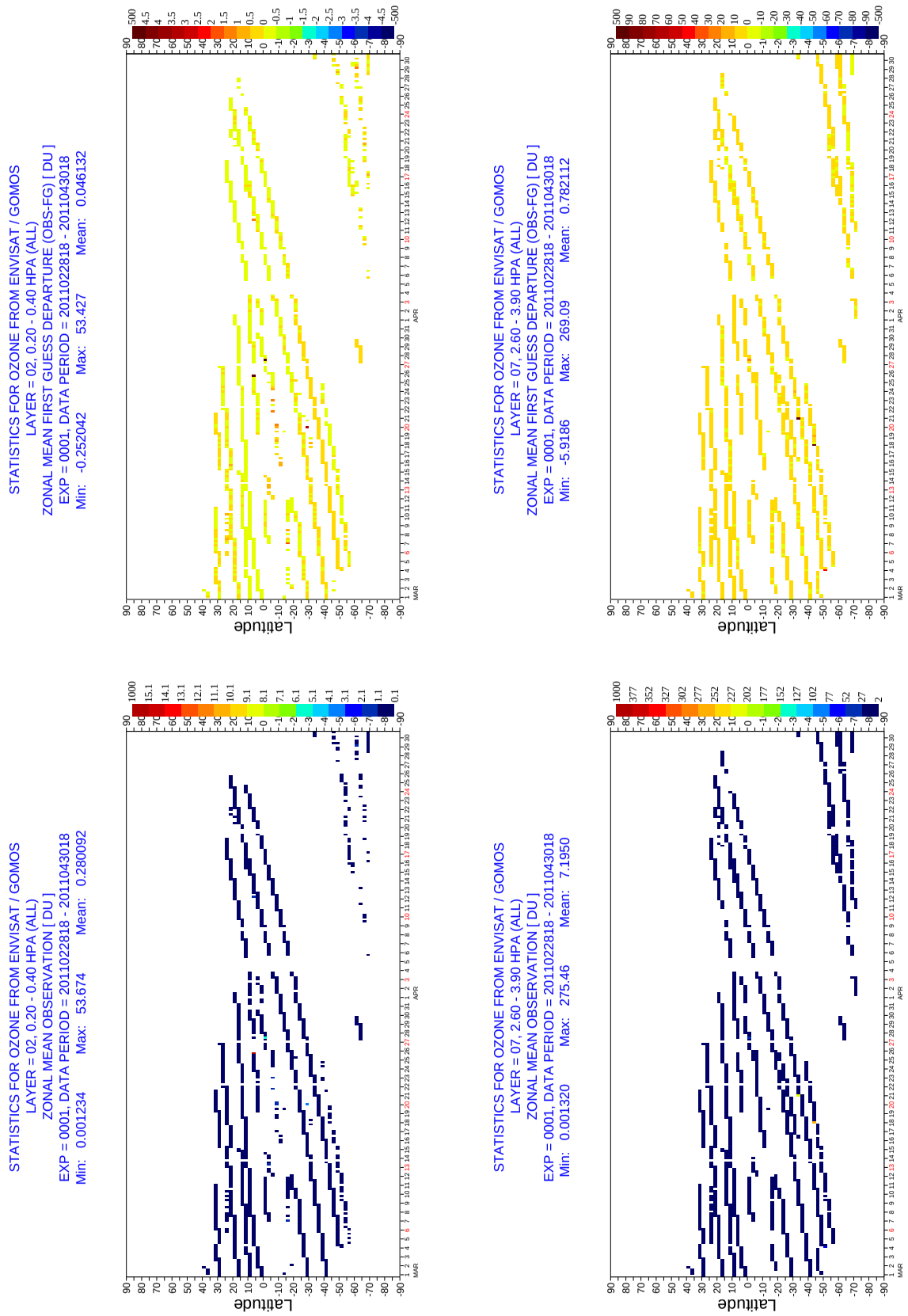


Fig. 19. Hovmoeller diagram of zonal mean ENVISAT GOMOS NRT ozone data per 6-hour cycle for March-April 2011 and of the zonal mean first-guess departures for layer 2 (0.2-0.4 hPa) and layer 7 (2.6-3.9 hPa).

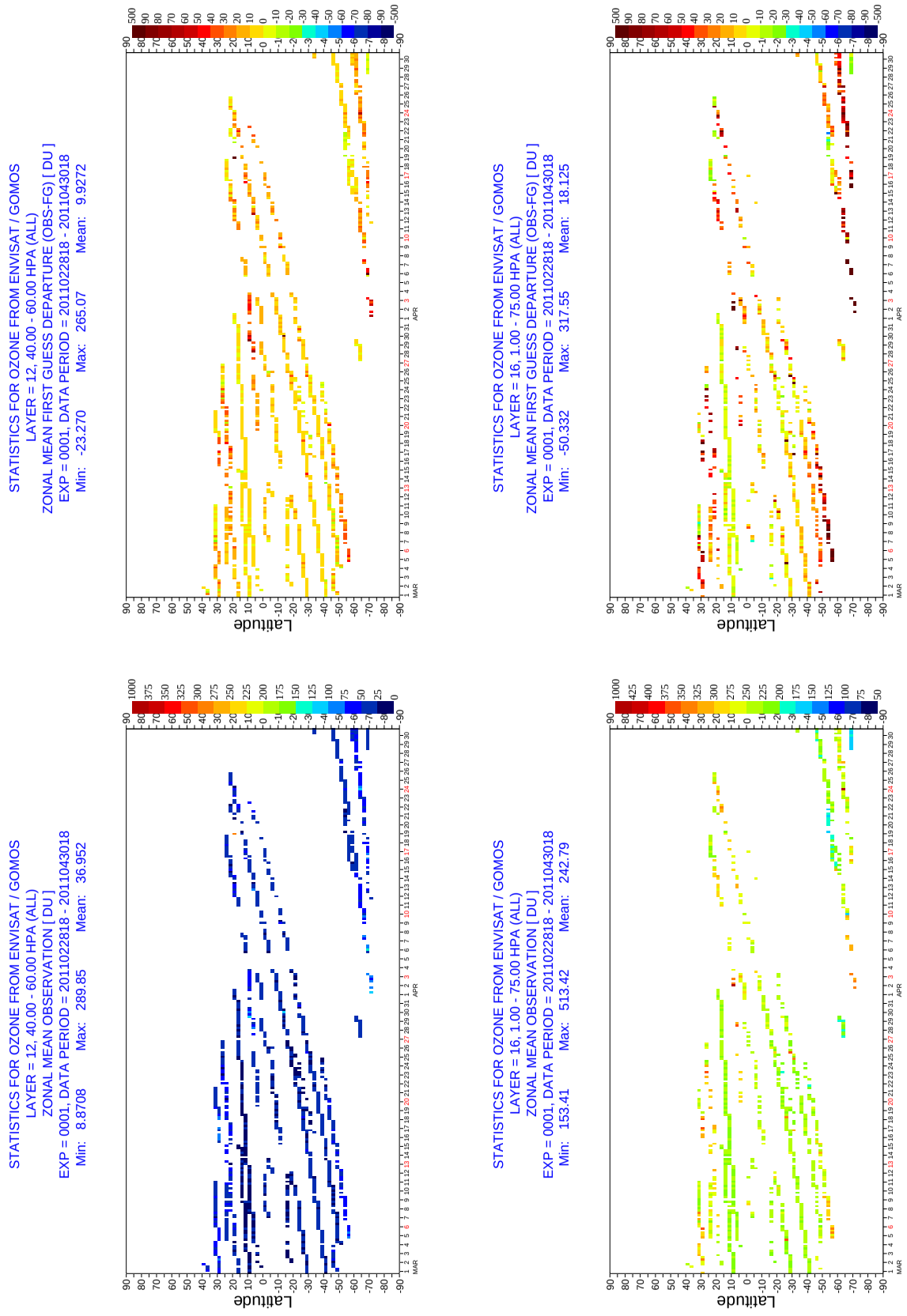


Fig. 20. As Fig. 19 but for layer 12 (40-60 hPa) and layer 16 (1-100 hPa).

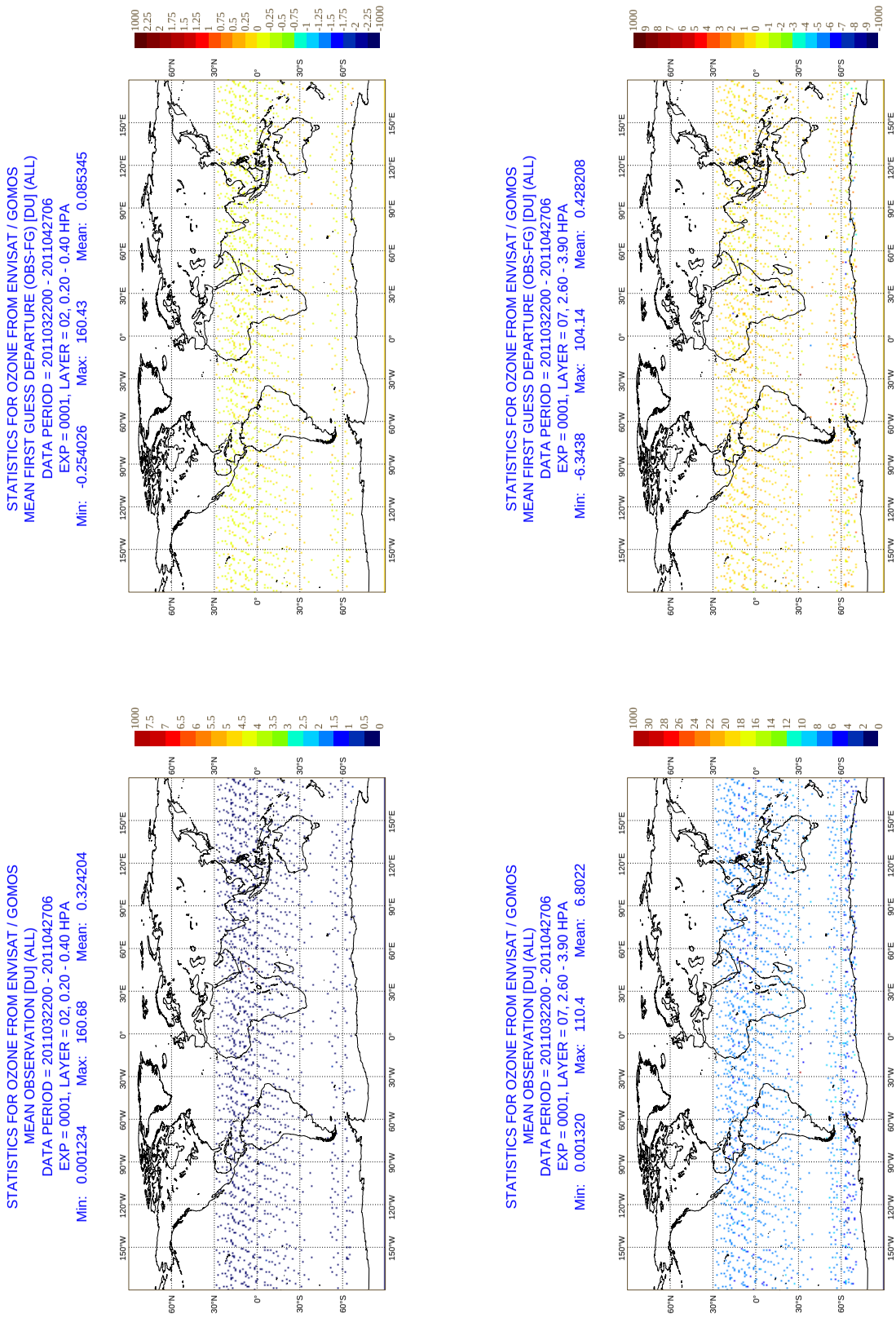


Fig. 21. Geographical distribution of mean ENVISAT GOMOS NRT ozone data and mean first-guess departures for April 2011 for layer 2 (0.2-0.4 hPa) and layer 7 (2.6-3.9 hPa).

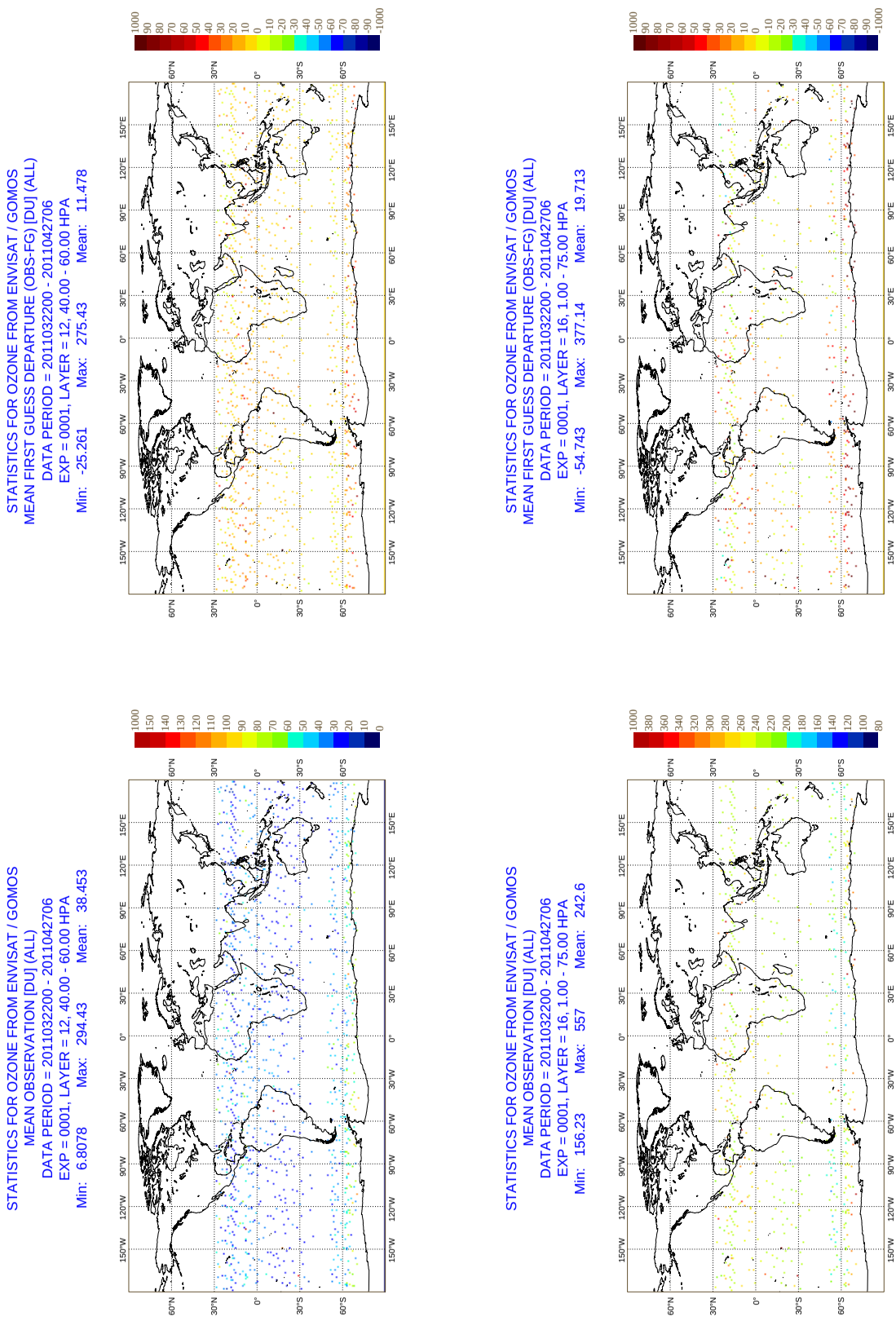


Fig. 22. As Fig. 21 but for layer 12 (40-60 hPa) and layer 16 (1-100 hPa).

REPORT ABOUT ENVISAT GOMOS NRT WATER VAPOUR DATA (GOM_RR_2P) FOR APRIL 2011

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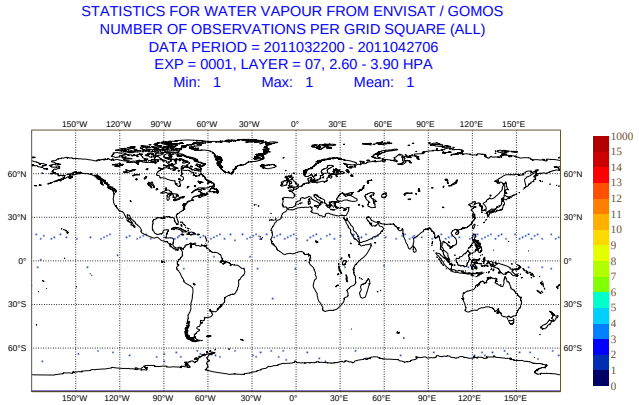

Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT water vapour data for level 7 (2.6-3.9 hPa) for April 2011.

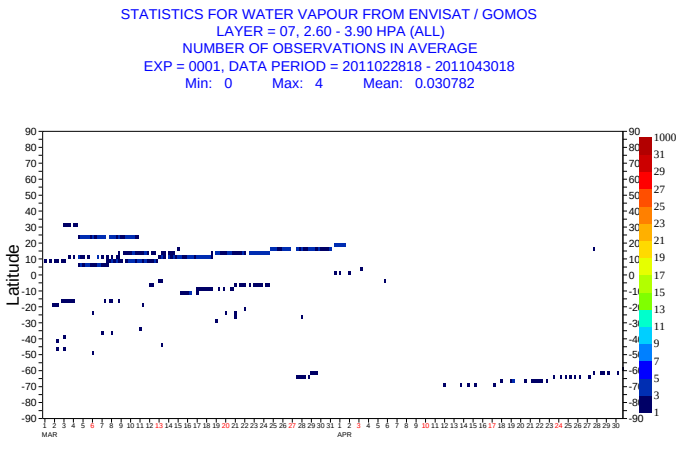

Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT water vapour data per 6-hour cycle for level 7 (2.6-3.9 hPa) for March-April 2011.

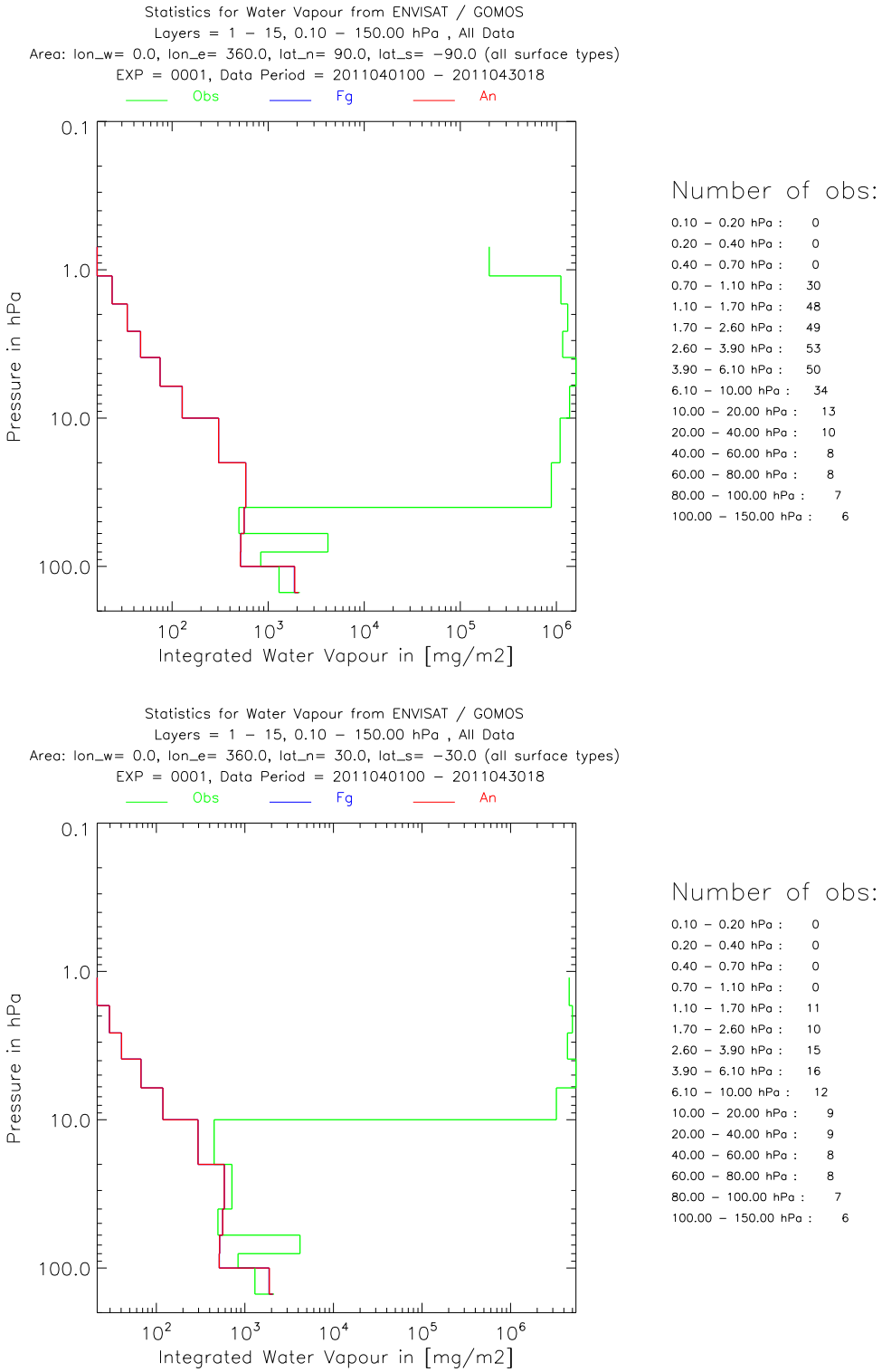

Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT water vapour data in mg/m^2 for April 2011. The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (green) globally averaged. The bottom plot shows a similar plot for the tropics (30N-30S). Plotted are the partial columns for the 16 levels listed to the right of the diagrams.

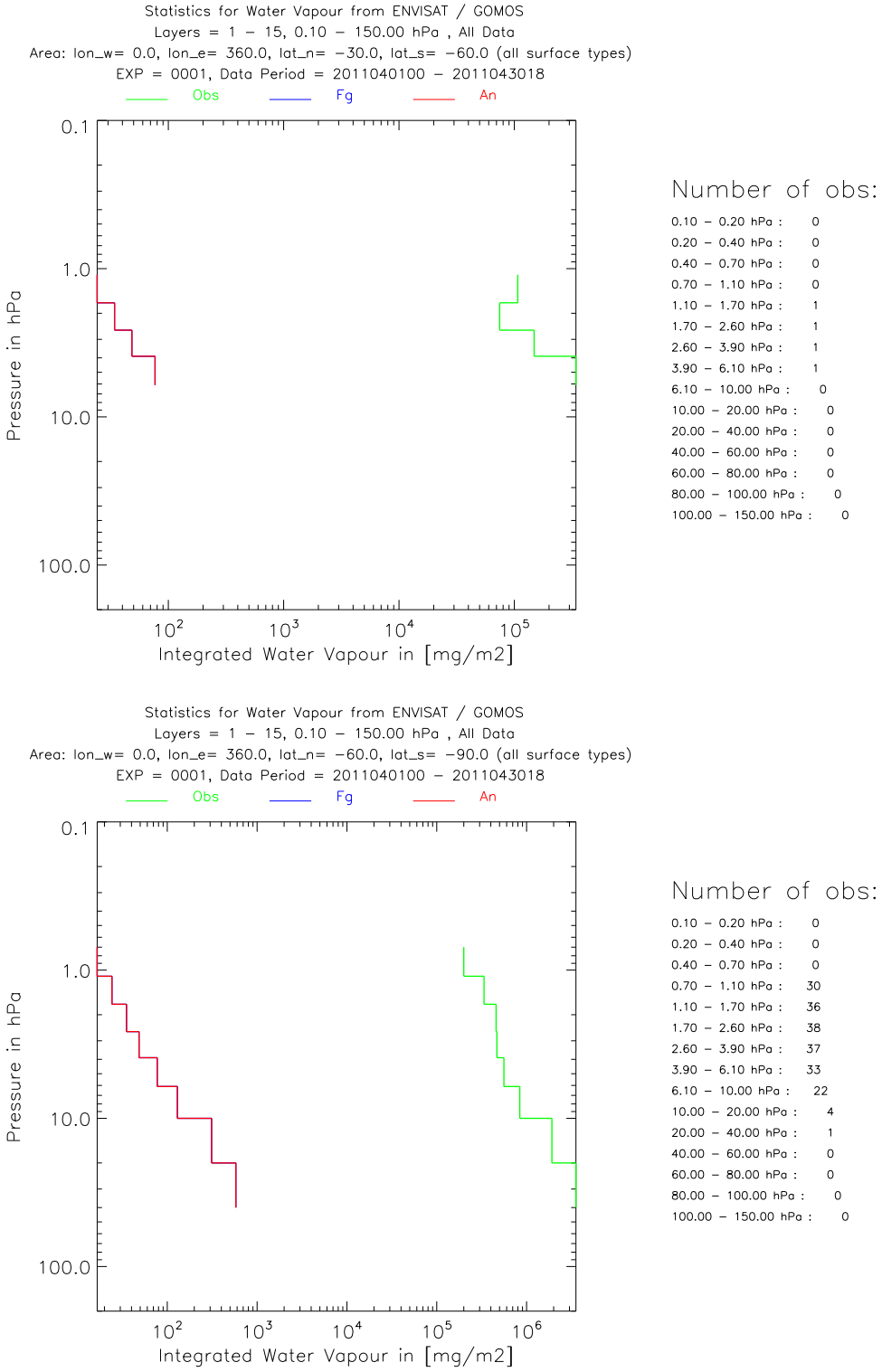

Fig. 4. As Fig. 3 but for the latitudinal band 30-60S (top panel) and 60-90S (bottom panel).

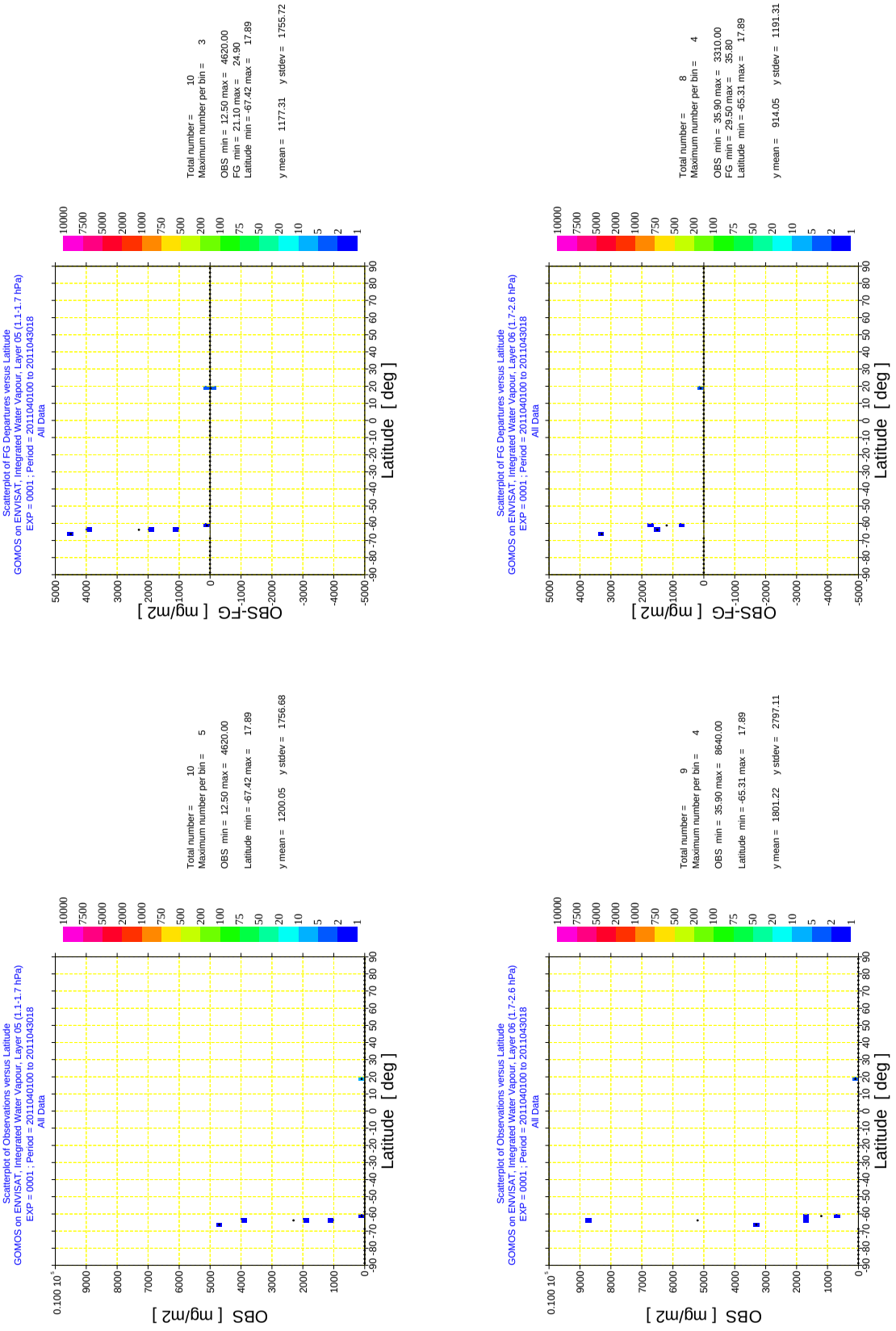

Fig. 5. Scatter plot of ENVISAT GOMOS NRT water vapour data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT water vapour data against latitude (right) for April 2011 for level 5 (1.1 hPa) and level 6 (1.7 hPa). The colours show the number of data per bin, and the black dots the mean value per bin.

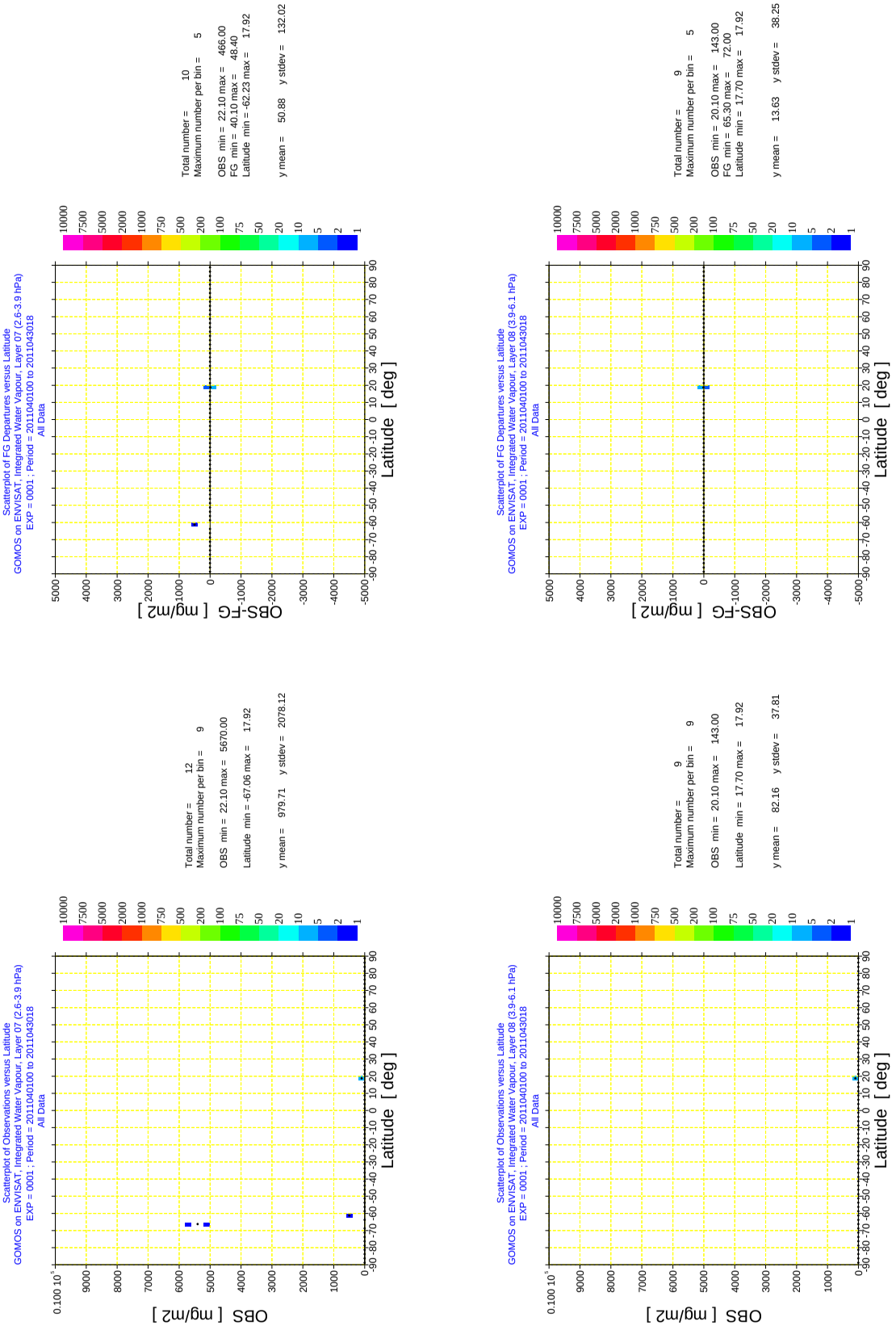

Fig. 6. As Fig. 5 but for level 7 (2.6 hPa) and level 8 (3.9 hPa).

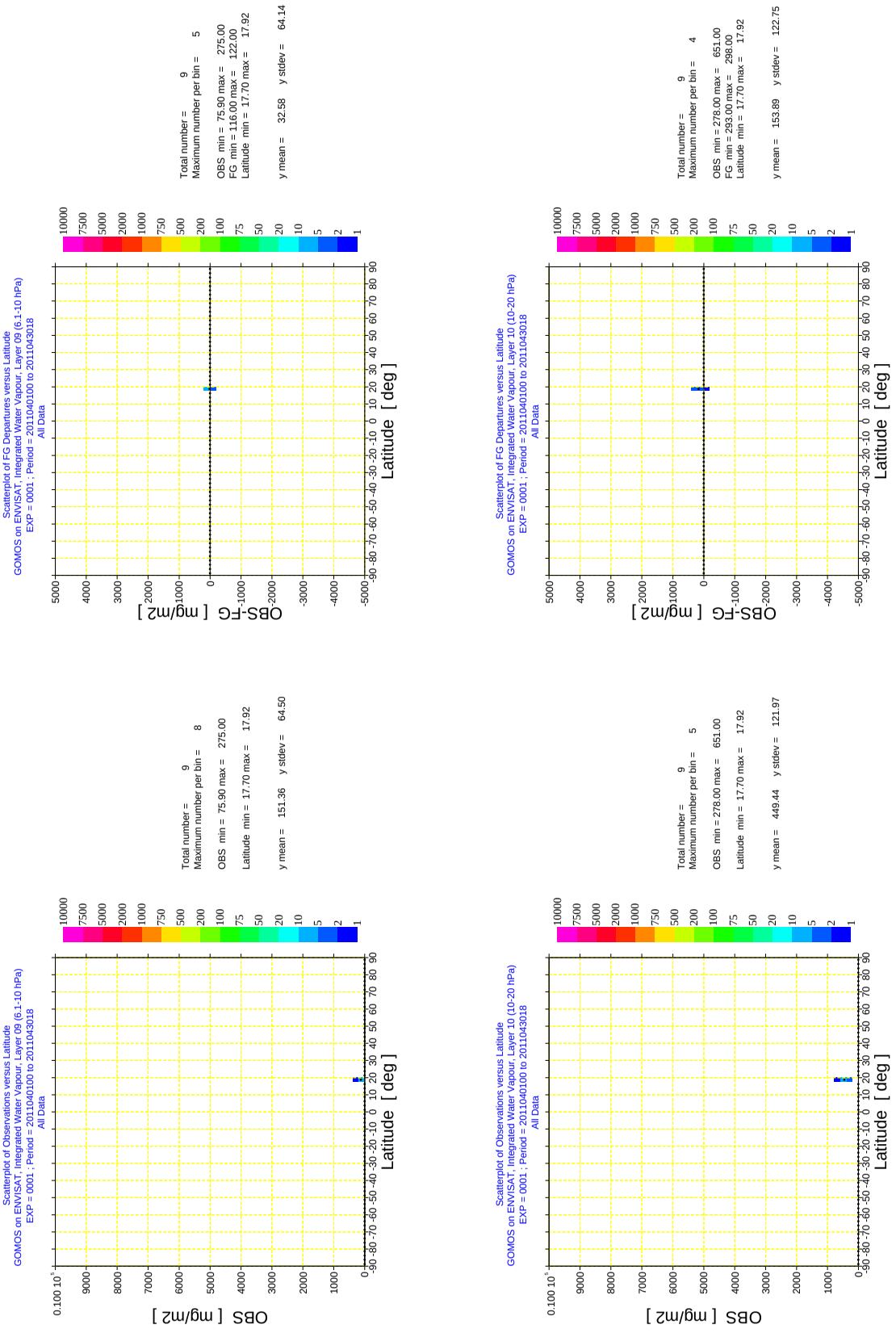

Fig. 7. As Fig. 5 but for level 9 (6.1 hPa) and level 10 (10 hPa).

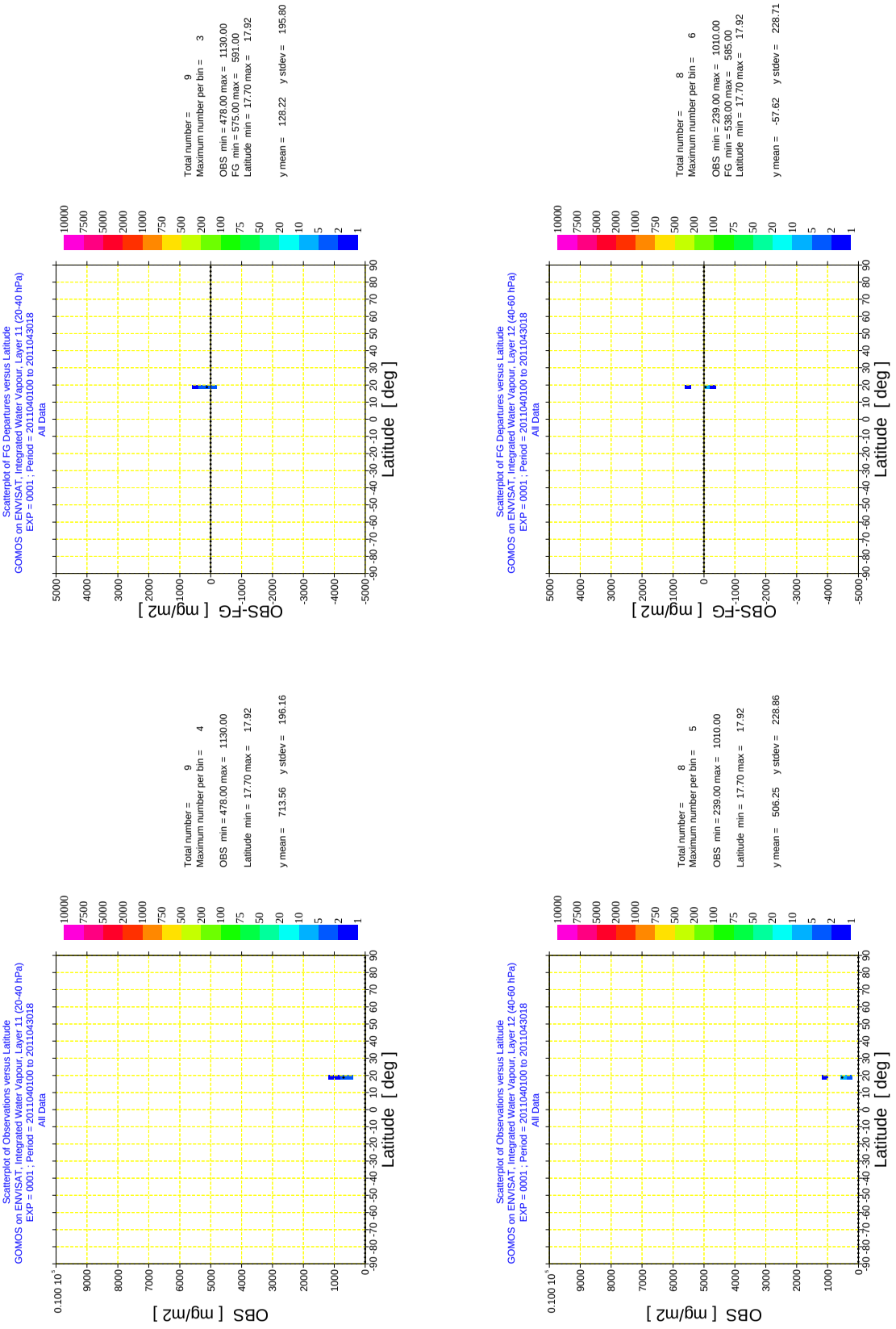

Fig. 8. As Fig. 5 but for level 11 (20-40 hPa) and level 12 (40-60 hPa).

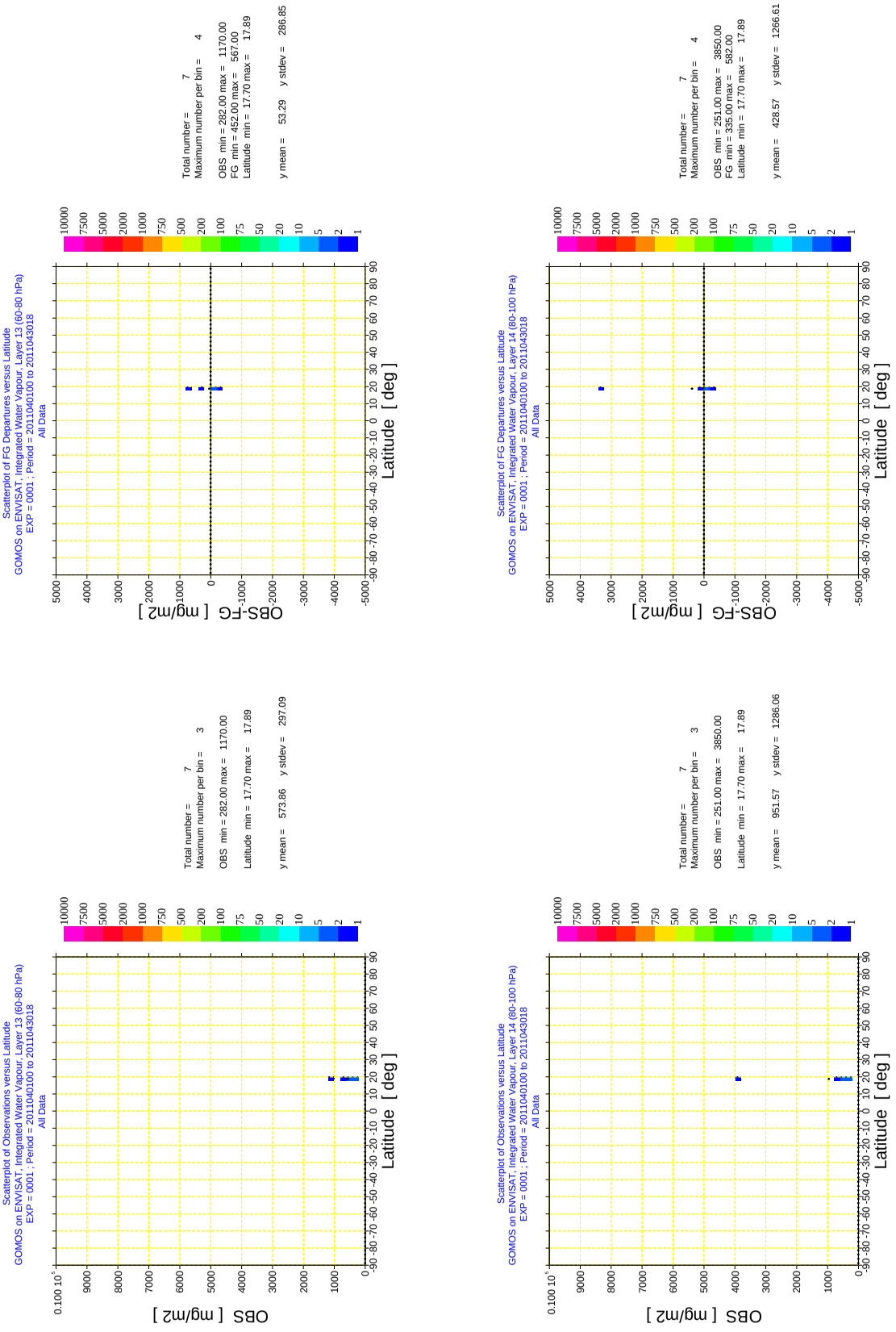

Fig. 9. As Fig. 5 but for level 13 (60-80 hPa) and level 14 (80-100 hPa).