REPORT ABOUT ENVISAT GOMOS NRT PRODUCTS (GOM_RR__2P) FOR SEPTEMBER 2008

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1. Key points for September 2008

- There were no data in the BUFR files at mid and high latitudes in the NH.
- Overall the temperature in the GOMOS bufr files was found in good agreement with the ECMWF temperature. The global first guess and analysis departures were typically negative at all levels in the global average with values of less than 1K in the lower stratosphere, and up to -8K in the upper stratosphere and mesosphere. When averaging over different latitudinal bands, biases within $\pm 1\%$ were generally found in stratosphere, and within -2 and -4% (-4 to -8K) in the mesosphere.
- The quality of the GOMOS ozone profiles seemed slightly degraded in September compared with that reported in August, especially at midlatitudes in the SH. In the global mean, the departures between GOMOS and ECMWF ozone profiles were within -8 and +40% in the mid stratosphere at most vertical levels, but larger than 50% at some layers in the mesosphere. The standard deviations of the first guess and analysis departures were larger than 15% at all levels. When averaging over latitudinal bands, the first guess and analysis departures between the GOMOS ozone profiles and their model equivalent were typically within -8 and +45% in the stratosphere, but larger than 50% at some mesospheric levels. The standard deviations of the analysis and first guess departures were larger than 10% at all latitudes and levels.
- The quality of the water vapour retrievals was still quite poor despite the data used in the monitoring statistics were only those acquired in dark-limb conditions. The monitoring statistics showed that the GOMOS water vapour values were from one to four orders of magnitude larger than their model equivalent at all vertical levels and latitudes. The largest differences between GOMOS WV and ECMWF WV were still found in the Stratosphere. A slightly higher level of agreement between the GOMOS WV data and their model equivalent was found at high latitudes in the SH where the first-guess and analysis departures were typically about one order of magnitude.
- The monitoring statistics for September were produced with the operational ECMWF model, CY33R1.

2. Quality and amount of received data

Data coverage and amount of received data during September 2008 are shown in figures 1 and 2 in the temperature, ozone and water vapour reports. Overall, just over 2400 (good) observations were available for temperature, about 2250 (good) observations were available for ozone, and just over 1000 for water vapour. The largest number of observations were available in the mesosphere and upper stratosphere in the cases of temperature and ozone (see figure 3 in the attached temperature, and ozone reports), and in the mid stratosphere in the case of water vapour (see figure 3 in the attached water vapour report). There were no temperature, water vapour and ozone data available at mid and high latitudes in the NH.

3. GOMOS temperature data

The quality of the temperature data in the GOMOS BUFR files was stable compared with that reported in the last few months. The profile plots (temperature report: Figures 3-6) show that both in the global average and in the average over latitudinal bands, temperature in the GOMOS BUFR files was generally colder than the operational ECMWF temperature at most vertical levels, with the only exception of the lower stratosphere at high latitudes in the SH. In the global average, the first-guess and analysis departures in the lower stratosphere were negative up to -2K (-1%) at 4hPa. In the mesosphere the global departures were within -1 and -4% (within -2 and -8K). The standard deviations of the first-guess and analysis departures were typically 1% in the stratosphere, and between 1 and 2% in the mesosphere.

In the tropics, the first guess and analysis departures were negative and just below -1% (-2 K) in all the stratosphere, and up to -3% (-6K) in the mesosphere. At midlatitudes in the SH, small positive biases (a few tenth of K) were found in the lower stratosphere (p>20hPa), and about -1K biases were seen in the upper stratosphere. Larger biases up to -5% were found in the mesosphere. At high latitudes in the SH, the first guess and analysis departures were about +1% (2 K) in the lower stratosphere up to 30 hPa, and larger than -1% (-2 K) in the upper stratosphere from about 5 hPa, with a smooth transition in the region of the atmosphere between 20 and 5 hPa. First guess and analysis departures up to -2% (-4K) were found in the mesosphere with the largest difference between 0.2 and 0.4 hPa. The standard deviations of the departures were about 1% at all latitudes and levels in the stratosphere, but larger (up to 3%) in the mesosphere.

The scatter plots (temperature report: Figures 7-14) showed a similar level of agreement between the temperature in the GOMOS files and the operational ECMWF temperature, with a variability of the first-guess departures within $\pm$4K at most vertical levels in the Stratosphere. Slightly larger departures were found in the mesosphere.

The Hovmoeller plots and the timeseries of the temperatures in the GOMOS files and their departures from the ECMWF temperature first-guess and analyses at several levels are shown in Figures 15, 16, 19-22 of the temperature report, respectively. Both the Hovmoeller plots and the timeseries confirmed the results discussed above.

4. GOMOS ozone data

The quality of the GOMOS ozone profiles seems to have degraded in September compared with that reported in August, especially at midlatitudes in the SH, and as a consequence of that also in the global average. The profile plots (ozone report: Figures 3-6) showed that both the ozone first guess and analyses were within the observation one-standard deviation range at most levels and latitudinal bands, and that, with the exception of the lower stratosphere (typically between 5 and 20 hPa), the GOMOS ozone generally exhibits larger values than their model equivalent. In the global average, the first-guess departures were within -8 and +40% at most vertical levels in the stratosphere, but larger than 50% at some layers in the mesosphere. The standard deviations of the departures were larger than 15% at all levels.

When averaged over latitudinal bands, first guess and analysis departures within -5 and 15% were found in most of the stratosphere (p> 40hPa) and lower mesosphere in the tropical band. As anticipated above, the departures between the GOMOS ozone values and their model equivalent at midlatitudes in the SH were larger than those for August, in particular they were between -8 and +45% at most levels in the stratosphere; departures larger than 50% were found at some layers in the mesosphere. At high latituds in the SH, the first-guess and analysis departures were between -8 and +45% in the stratosphere, and within $\pm$ 15% in the mesosphere. The standard deviations of the analysis and first guess departures were larger than 10% at all levels and latitudinal bands.

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

The timeseries of GOMOS ozone and departures at several levels and the Hovmoeller plots are shown in figures 15-18, and 19-20 of the ozone report, respectively. Both the timeseries and the Hovmoeller plots confirm the level of agreement between NRT GOMOS ozone retrievals and the ECMWF ozone analyses discussed above.

5. Water vapour data

As found in the previous months also in September the level of agreement between the GOMOS water vapour and the ECMWF water vapour first guess and analyses was generally poor at all levels in the tropics and at midlatitudes in the SH, and as a consequence of that in the global average. A higher level of agreement was found at high latitudes in the SH.

The profile plots (Water Vapour report: Figures 3-4) showed that the GOMOS water vapour values were from one to four orders of magnitude larger than those given by the model at all vertical levels and latitudinal bands. As discussed in the last months, the largest differences were still found in the Stratosphere, where not only did the GOMOS observations exhibit on average values of four orders of magnitude larger than their model equivalent, they also were larger than the mean GOMOS tropospheric observation. A higher level of agreement was found at high latitudes in the SH. Here the GOMOS WV observations still exihibited higher values than their model equivalent, but the departures were considerably smaller than those seen elsewhere. In addition, the WV content especially in the upper stratosphere decreases with height as expected. Yet, the first-guess and analysis departures were typically more than one order of magnitude at all levels.

The scatter plots (water vapour report: Figures 5-10) confirm the above analysis. They showed large scatter in the GOMOS water vapour data at all vertical levels and available latitudes, that led to large scatter in the first guess departures.

The Hovmoeller plots and the timeseries of GOMOS water vapour and departures at different levels are presented in figures 11, and 12 of the water vapour report, respectively. Because of the very large difference between the ECMWF WV and the GOMOS WV, very little signal was detected in the time series at most levels (figure 13).

6. Remarks

This monitoring report was produced with the operational ECMWF model (CY33R1). Ozone layers from SBUV/2 on NOAA-16, NOAA-17 and NOAA-18, SCIAMACHY total column ozone data produced by KNMI, as well as OMI total column ozone were actively assimilated.

The results presented in this reports made use of only the observations acquired in dark-limb conditions.

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

REPORT ABOUT ENVISAT GOMOS NRT OZONE DATA (GOM_RR__2P) FOR SEPTEMBER 2008

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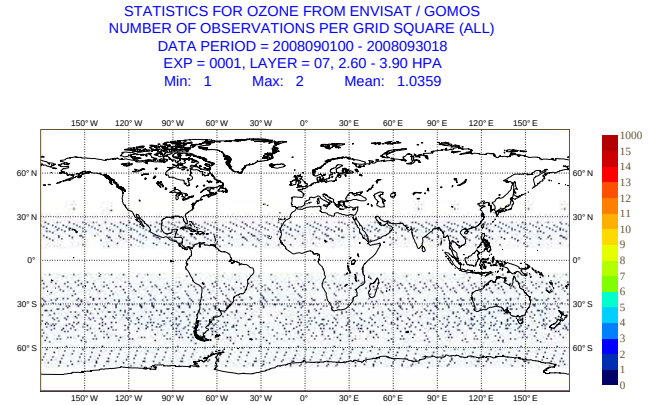


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT ozone data for layer 7 (2.60-3.90 hPa) for September 2008.

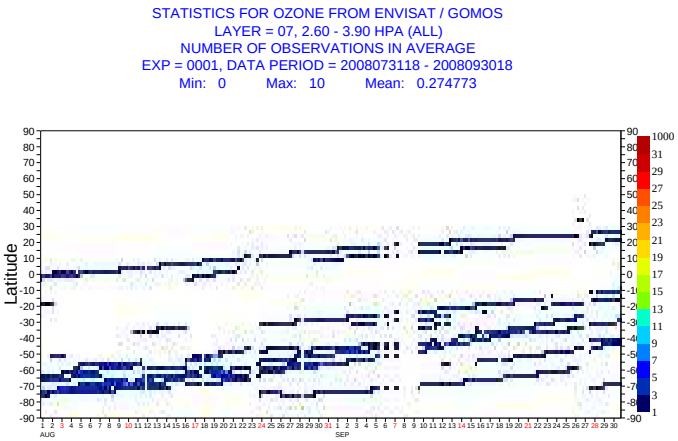


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT ozone data per 6-hour cycle for layer 7 (2.60-3.90 hPa) for August-September 2008.

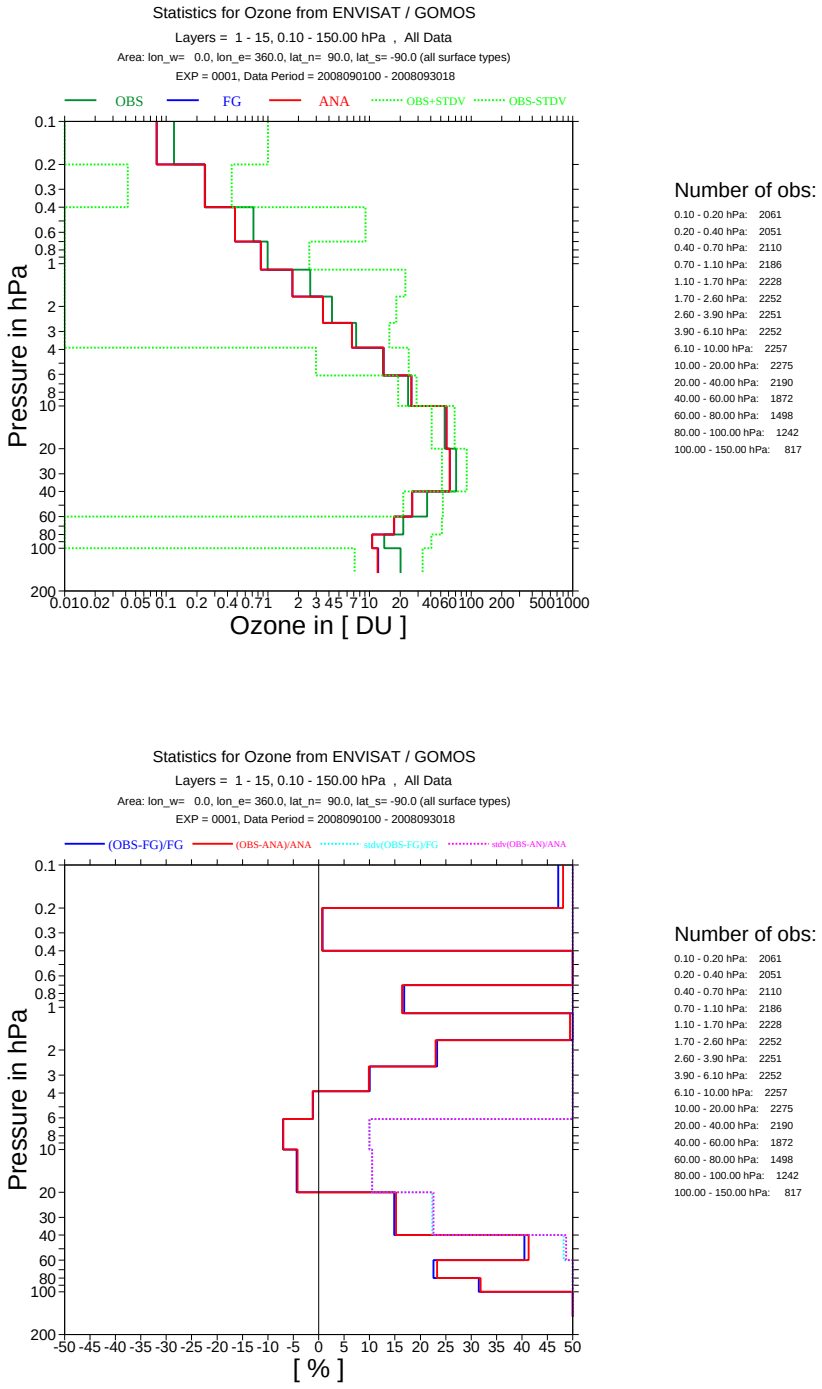
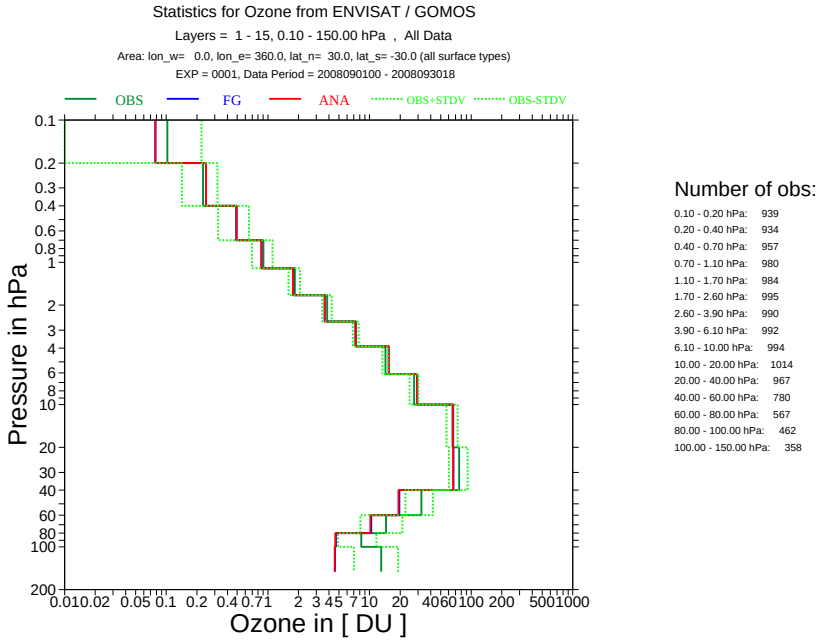


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT ozone data in DU for September 2008 (global mean). The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (red), and the mean observation (green) +/- 1 standard deviation (green dotted lines). The 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.



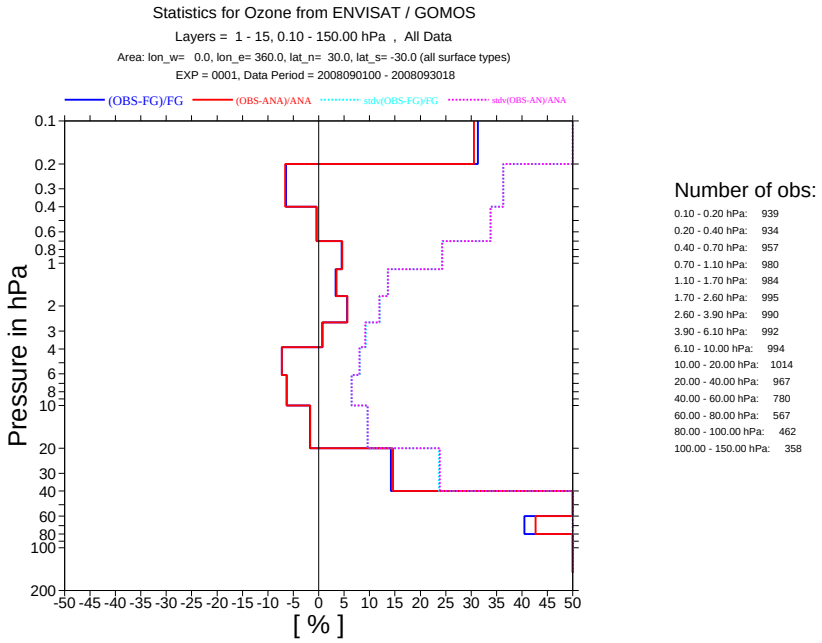
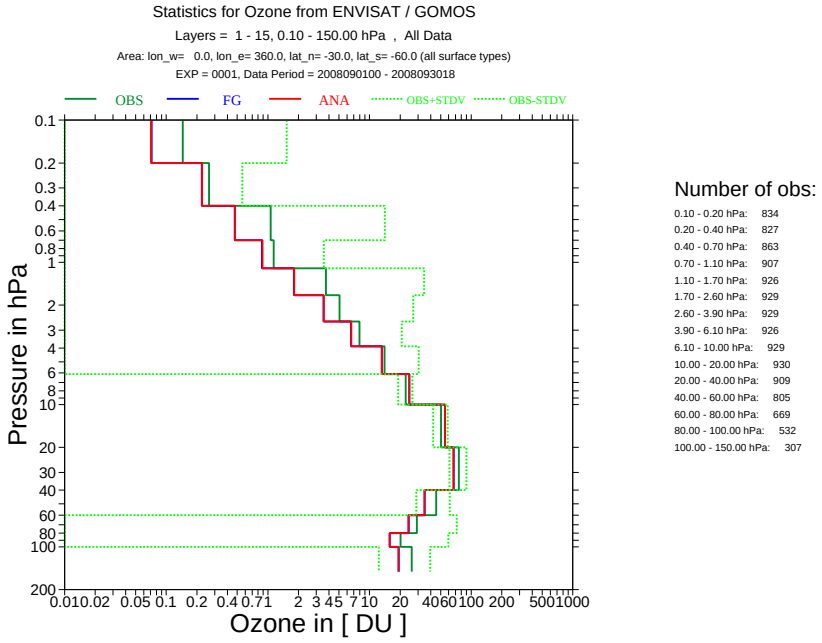


Fig. 4. As Fig. 3 but for 30N-30S.



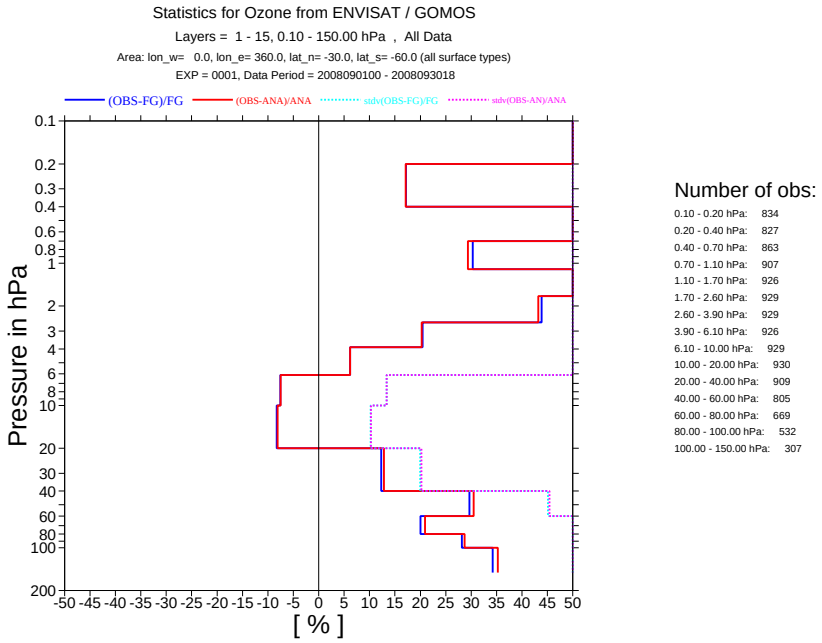
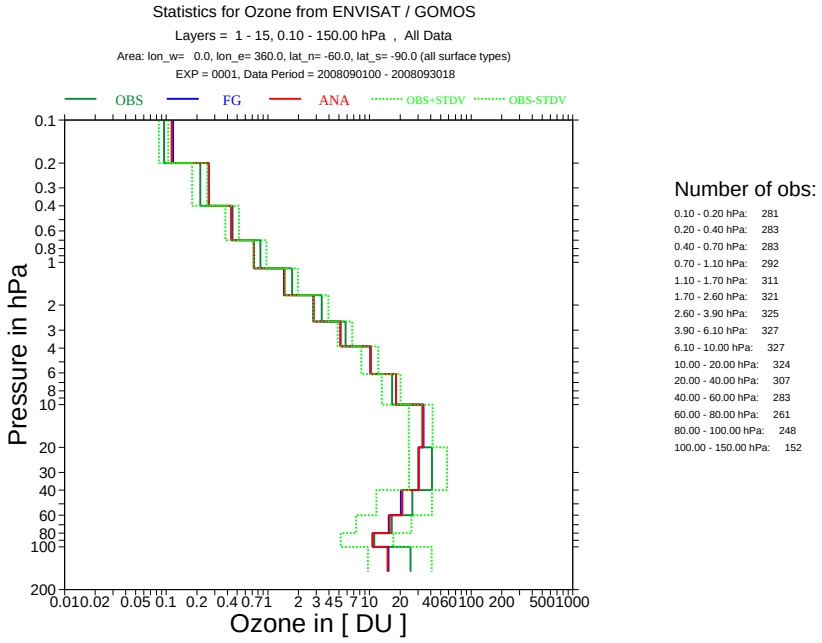


Fig. 5. As Fig. 3 but for 30S-60S.



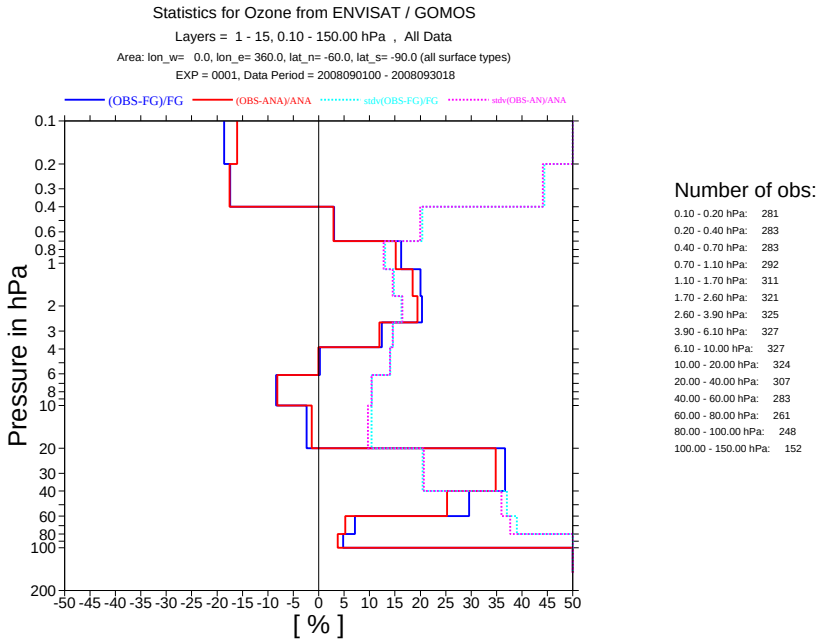


Fig. 6. As Fig. 3 but for 60-90S.

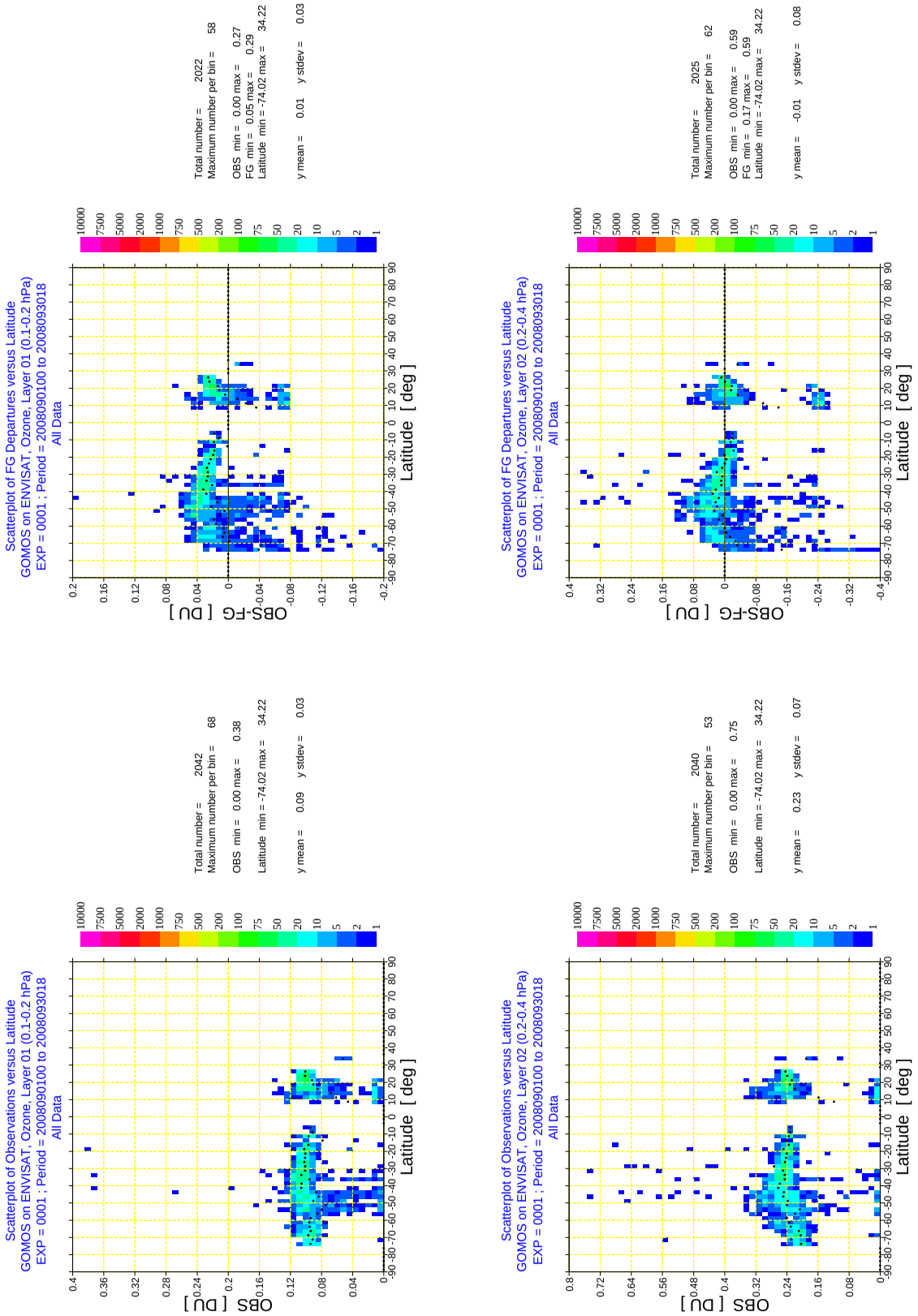


Fig. 7. Scatter plot of ENVISAT GOMOS NRT ozone data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT ozone data against latitude (right) for September 2008 for layer 1 (0.1-0.2 hPa) and layer 2 (0.2-0.4 hPa). The colours show the number of data per bin, the black dots the mean value per bin.

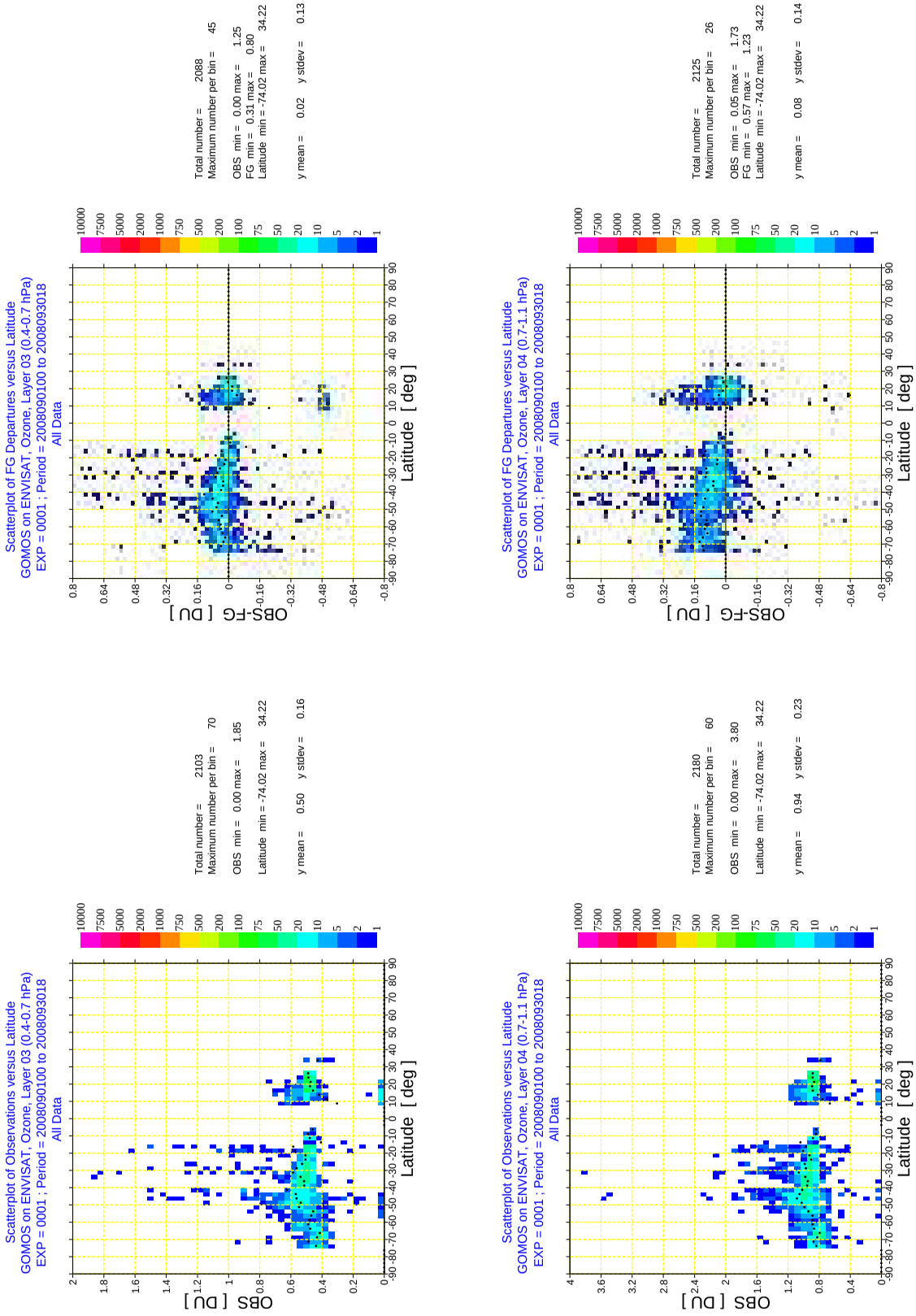


Fig. 8. As Fig. 7 but for layer 3 (0.4-0.7 hPa) and layer 4 (0.7-1.1 hPa).

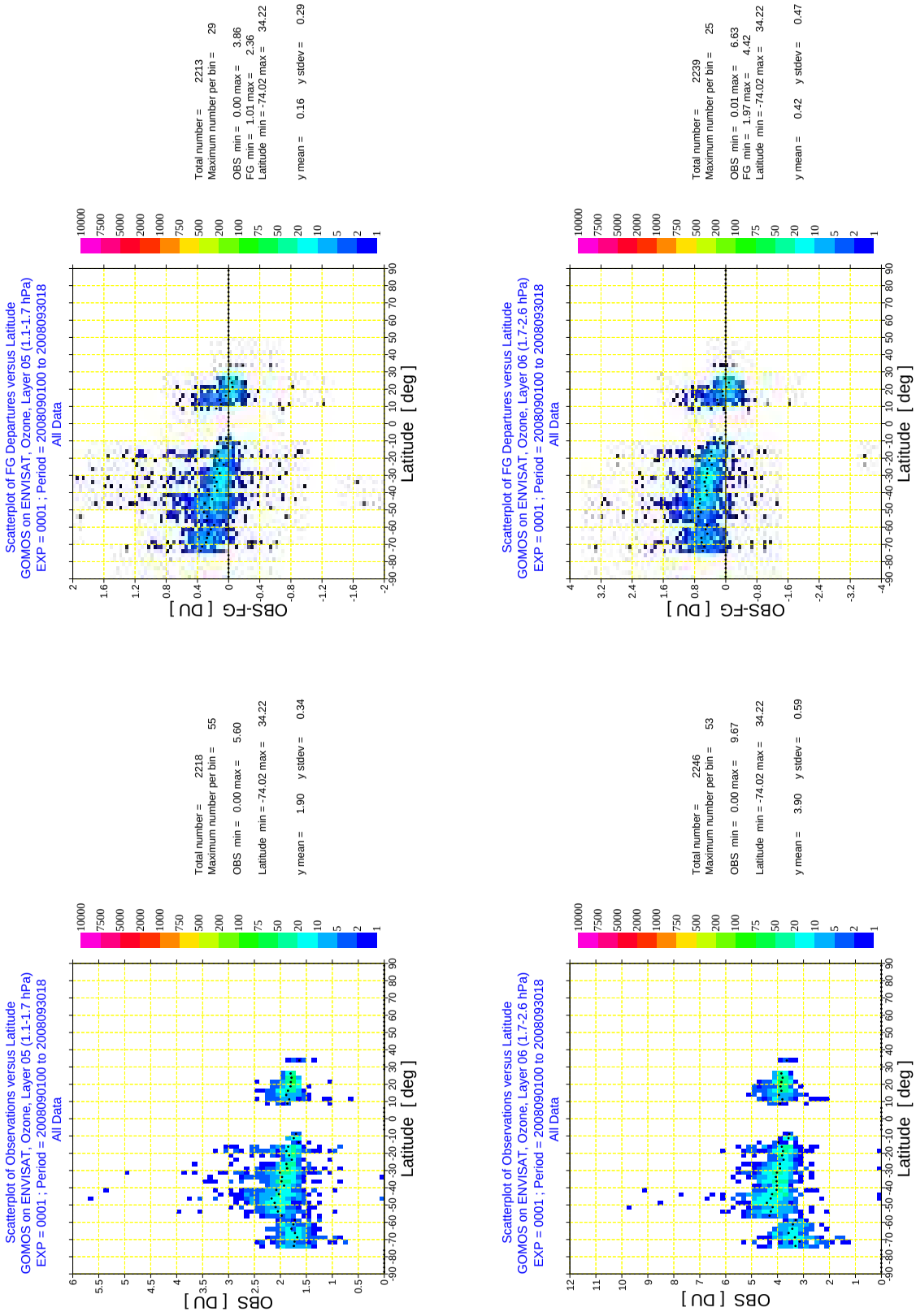


Fig. 9. As Fig. 7 but for layer 5 (1.1-1.7 hPa) and layer 6 (1.7-2.6 hPa).

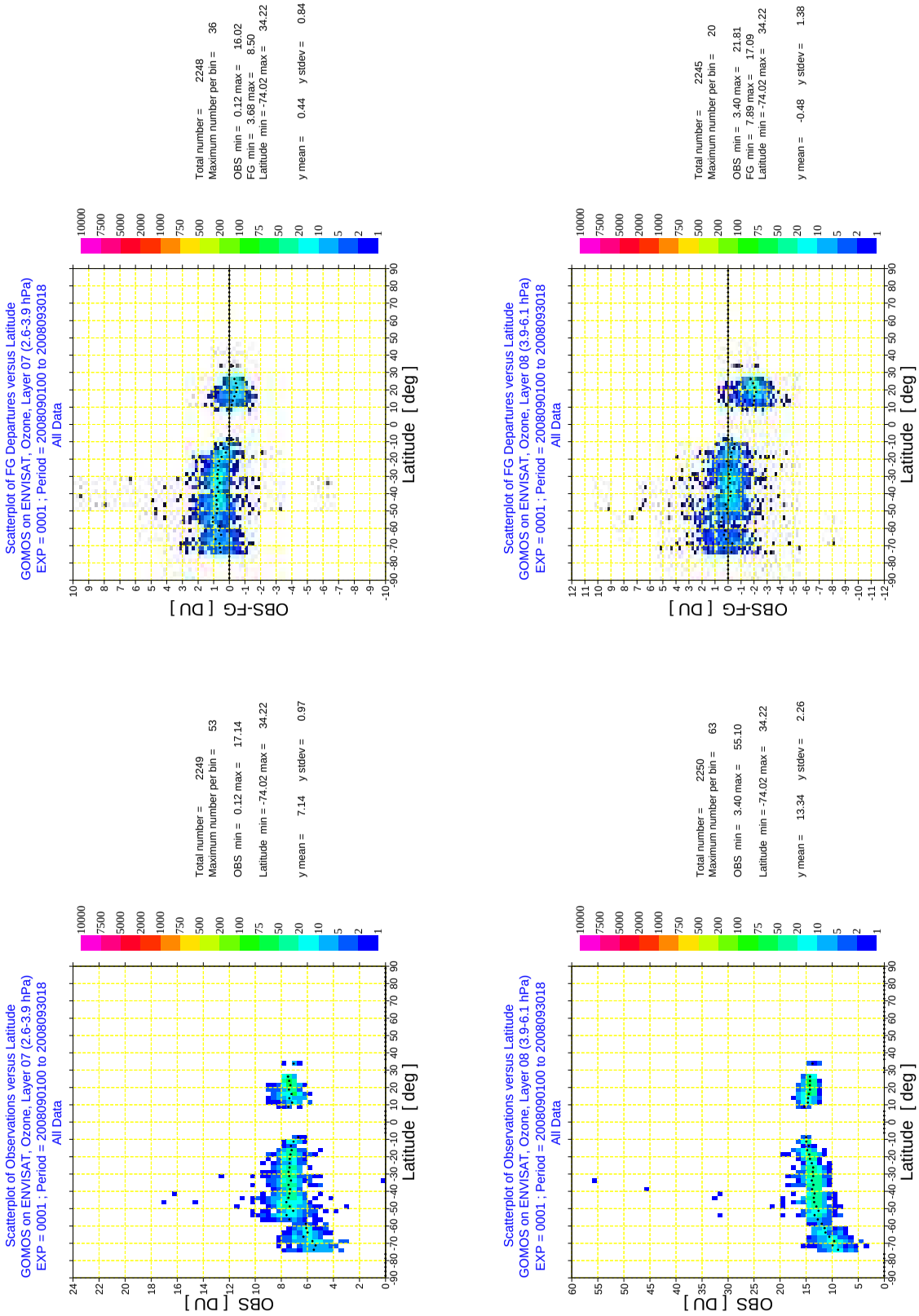


Fig. 10. As Fig. 7 but for layer 7 (2.6-3.9 hPa) and layer 8 (3.9-6.1 hPa).

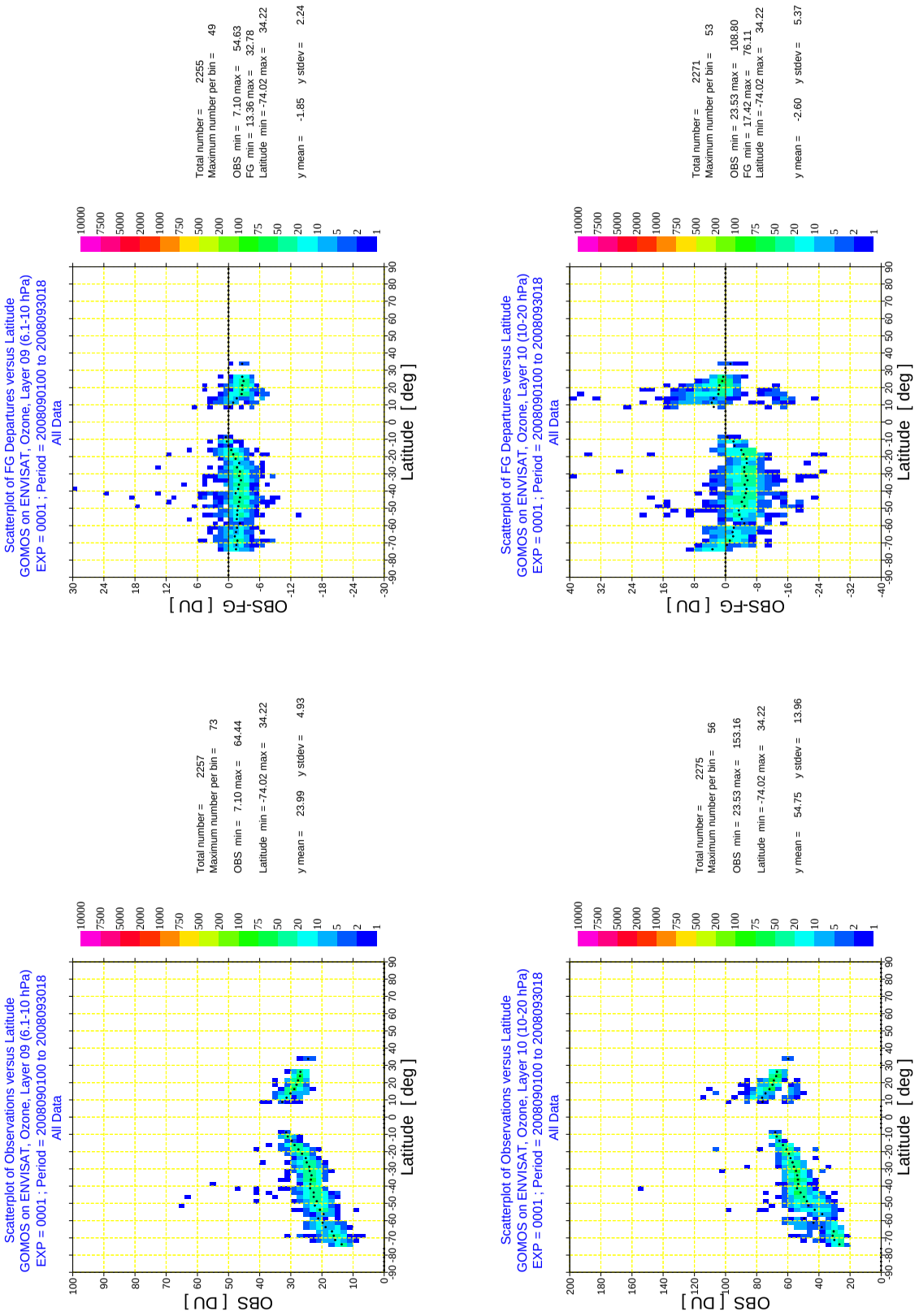


Fig. 11. As Fig. 7 but for layer 9 (6.1-10 hPa) and layer 10 (10-20 hPa).

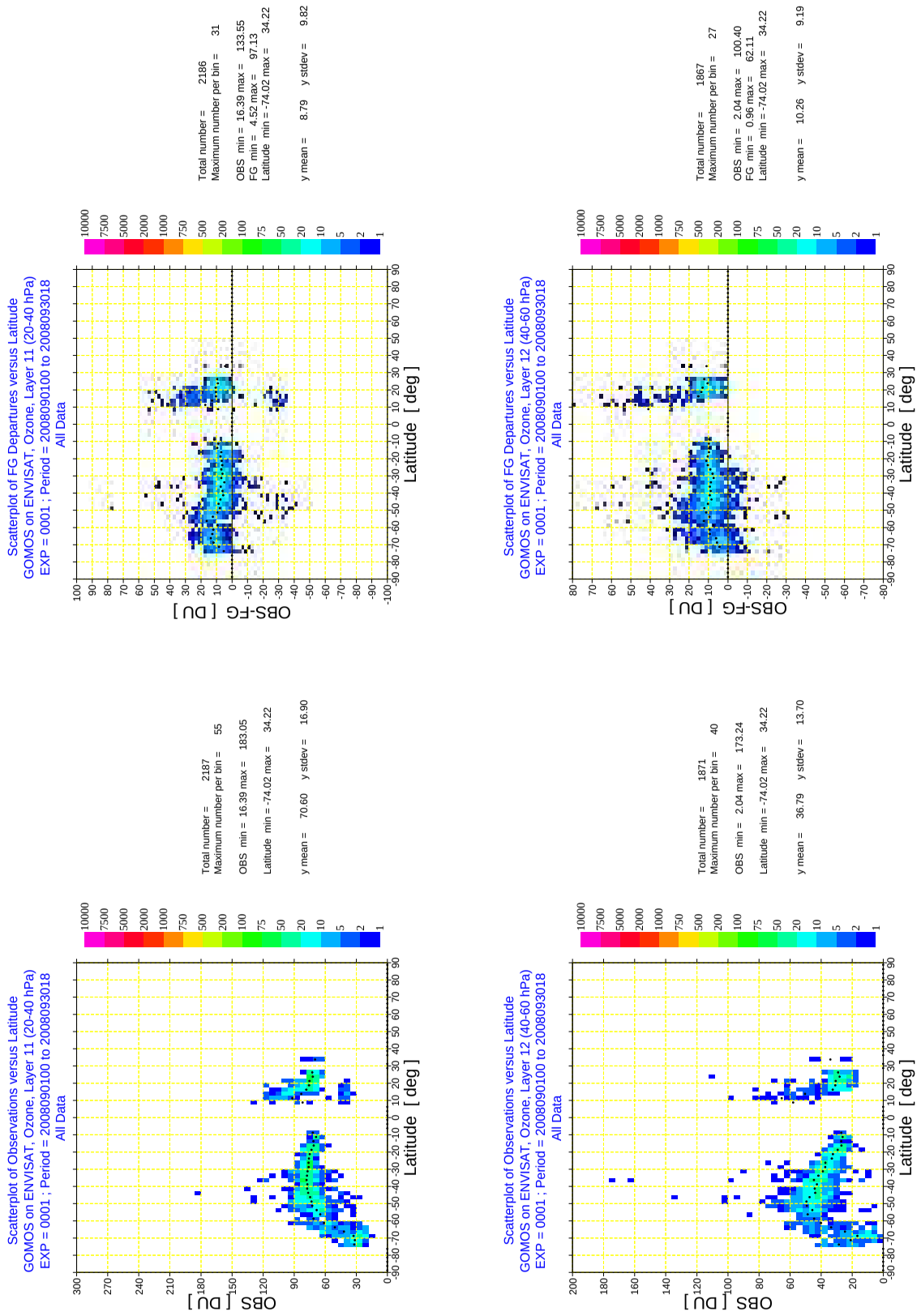


Fig. 12. As Fig. 7 but for layer 11 (20-40 hPa) and layer 12 (40-60 hPa).

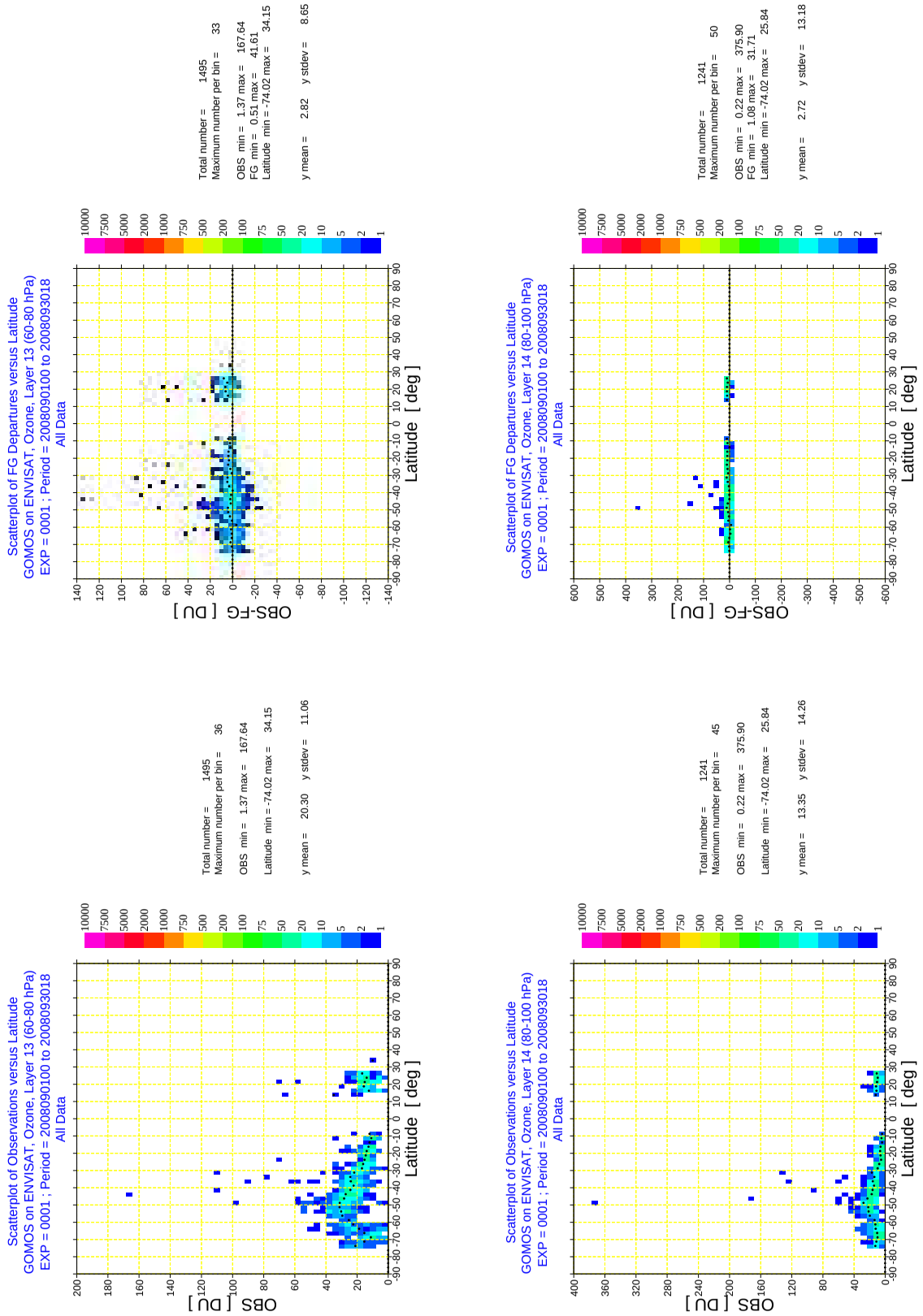


Fig. 13. As Fig. 7 but for layer 13 (60-80 hPa) and layer 14 (80-100 hPa).

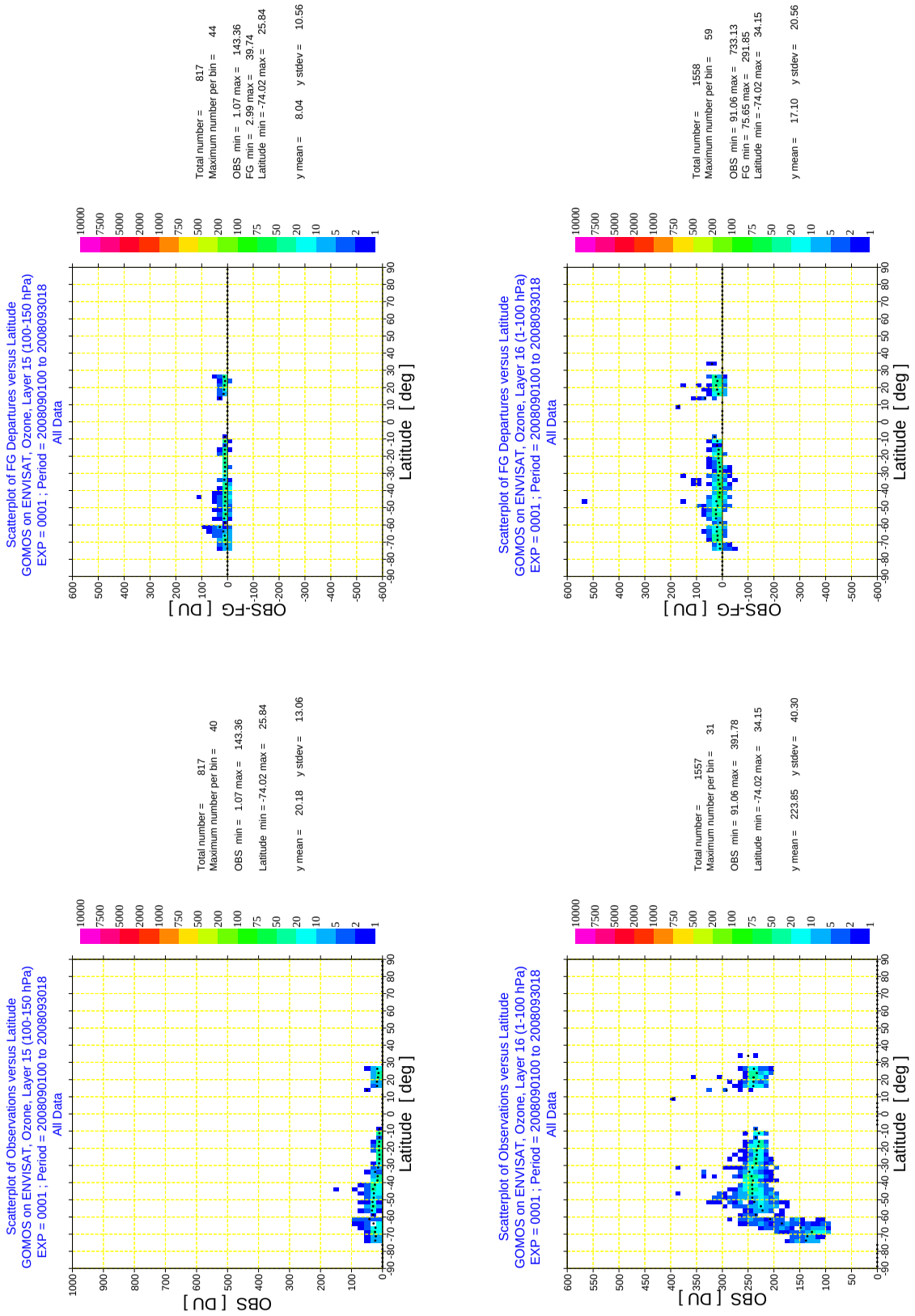


Fig. 14. As Fig. 7 but for layer 15 (100-150 hPa) and layer 16 (1-100 hPa).

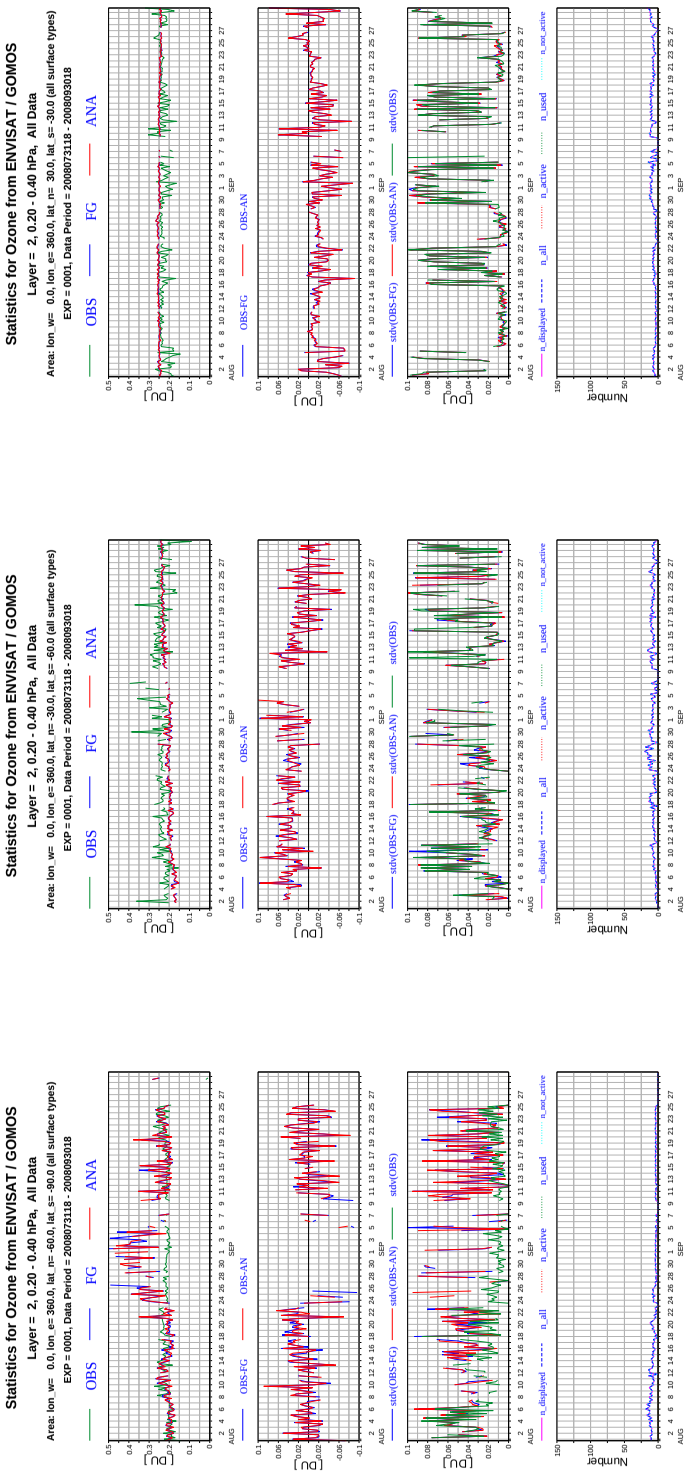


Fig. 15. Timeseries of mean ENVISAT GOMOS NRT ozone data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for layer 2 (0.2-0.4 hPa) 30N-30S, 30-60S, and 60-90S for the period August-September 2008.

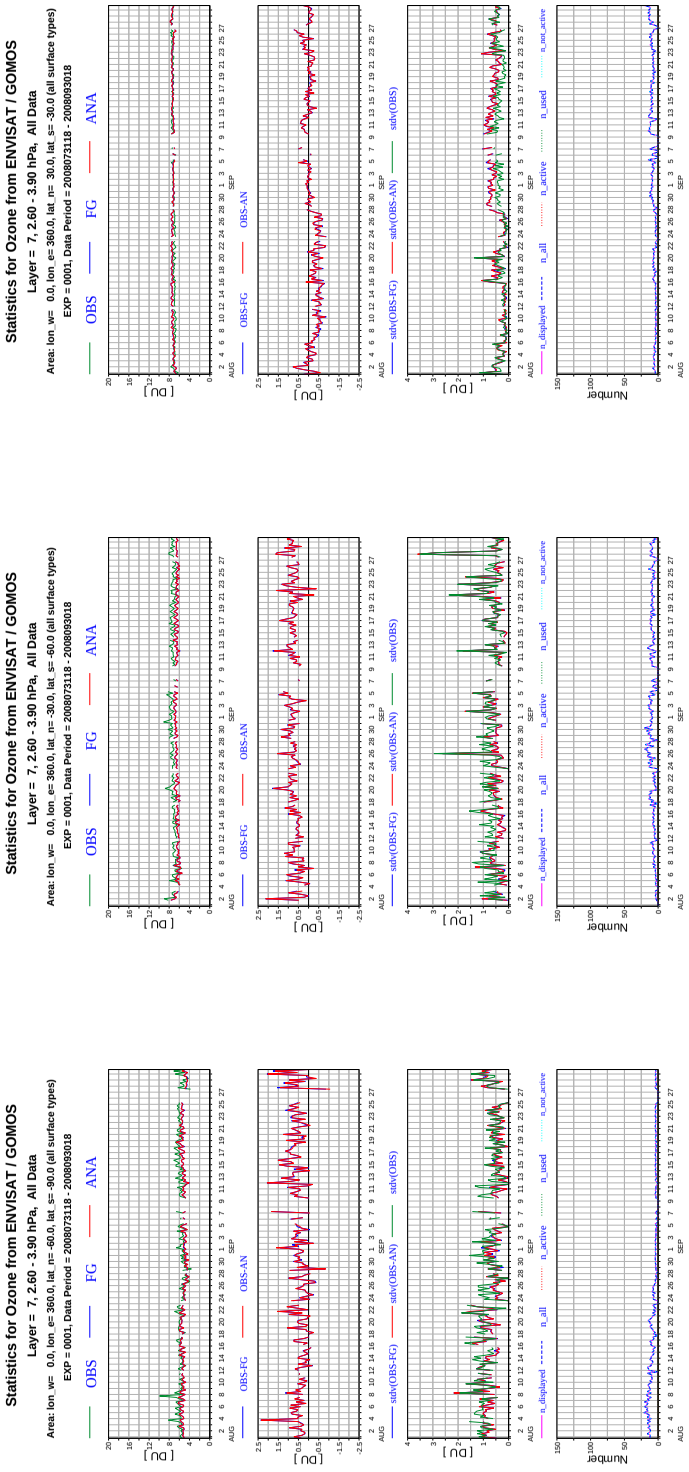


Fig. 16. As Figure 15, but for layer 7 (2.6-3.9 hPa).

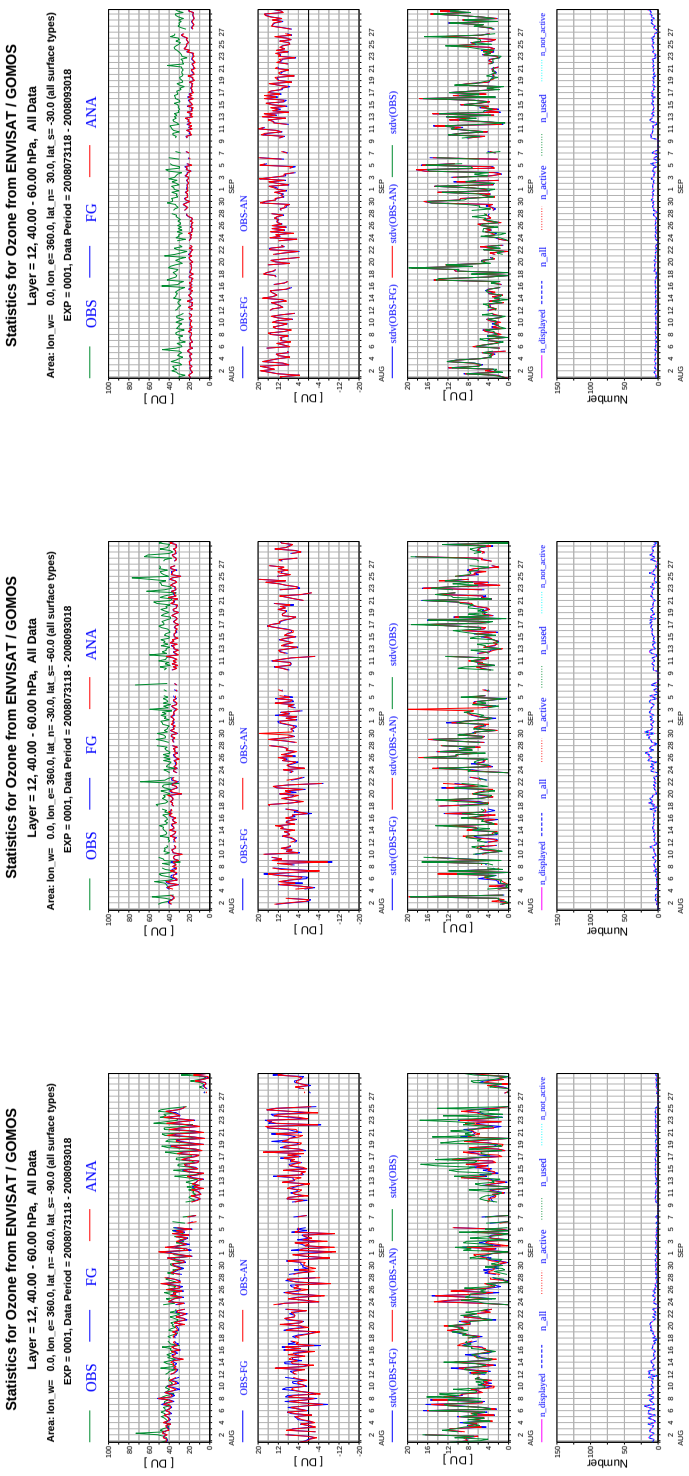


Fig. 17. As Figure 15, but for layer 12 (40-80 hPa).

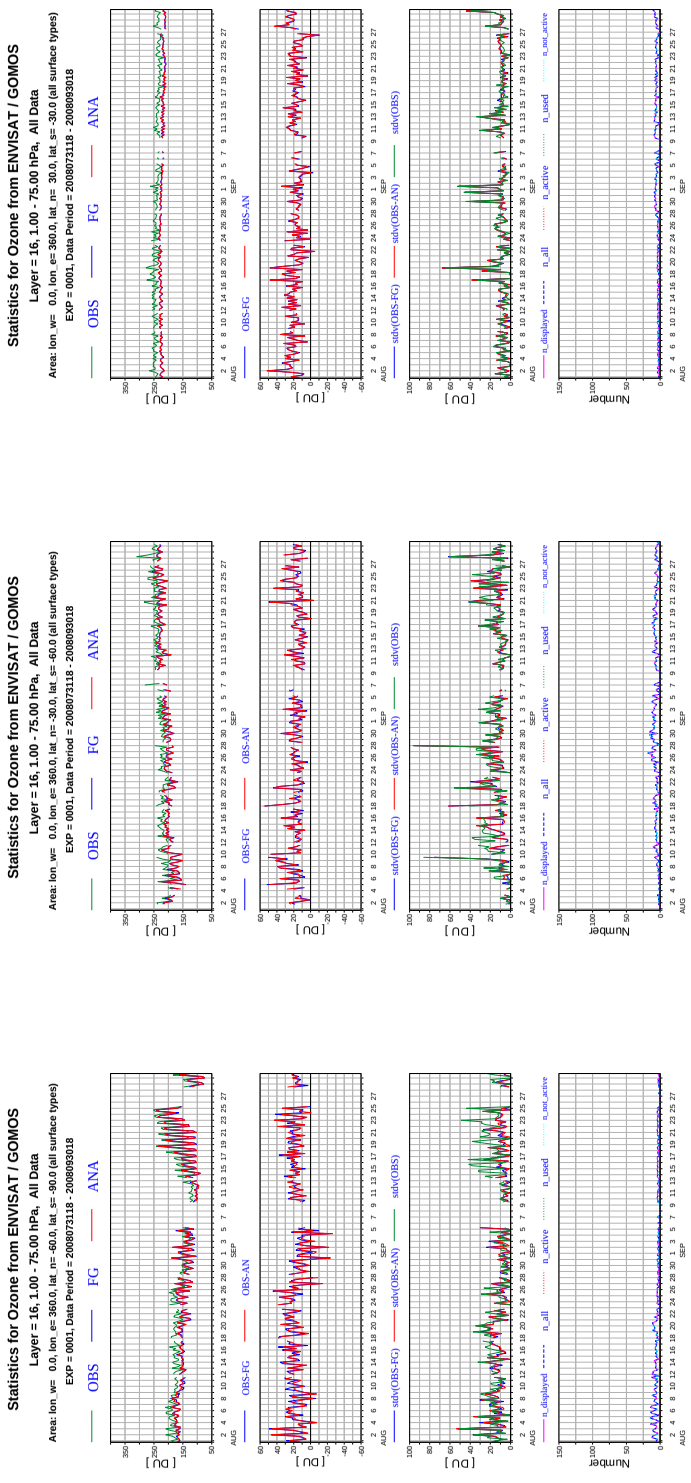


Fig. 18. As Figure 15, but for layer 16 (1-100 hPa).

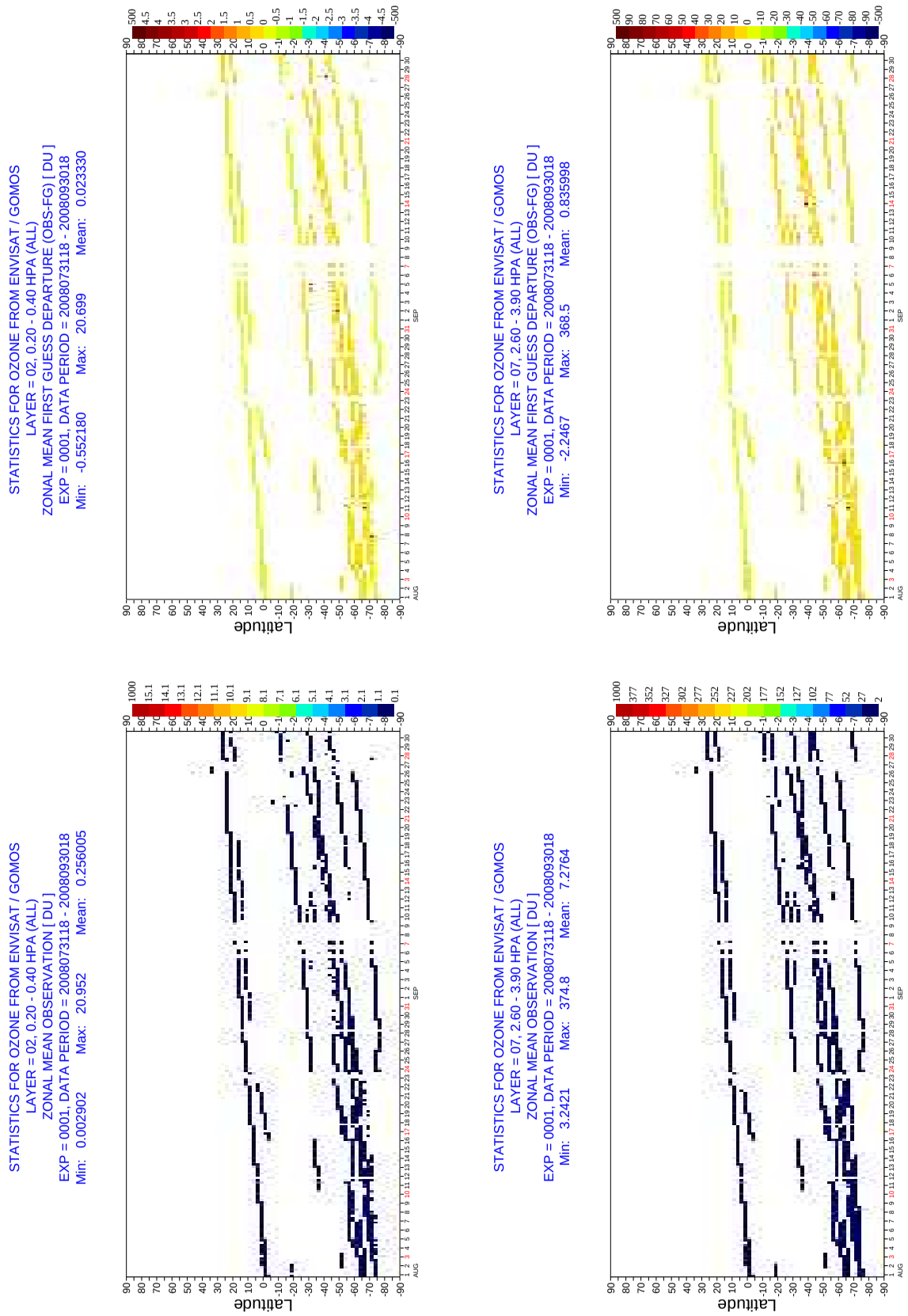


Fig. 19. Hovmoeller diagram of zonal mean ENVISAT GOMOS NRT ozone data per 6-hour cycle for August-September 2008 and of the zonal mean first-guess departures for layer 2 (0.2-0.4 hPa) and layer 7 (2.6-3.9 hPa).

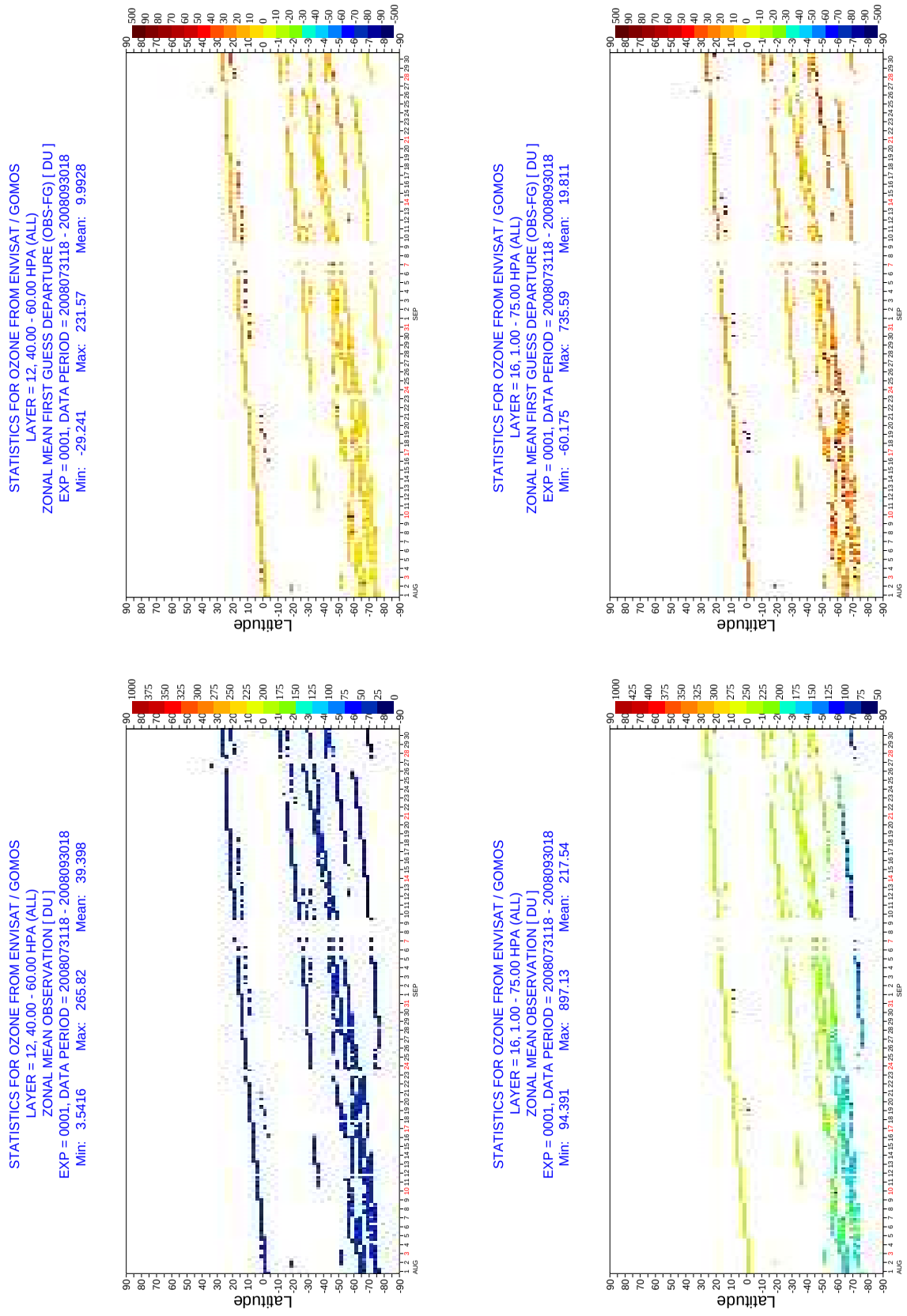


Fig. 20. As Fig. 19 but for layer 12 (40-60 hPa) and layer 16 (1-100 hPa).

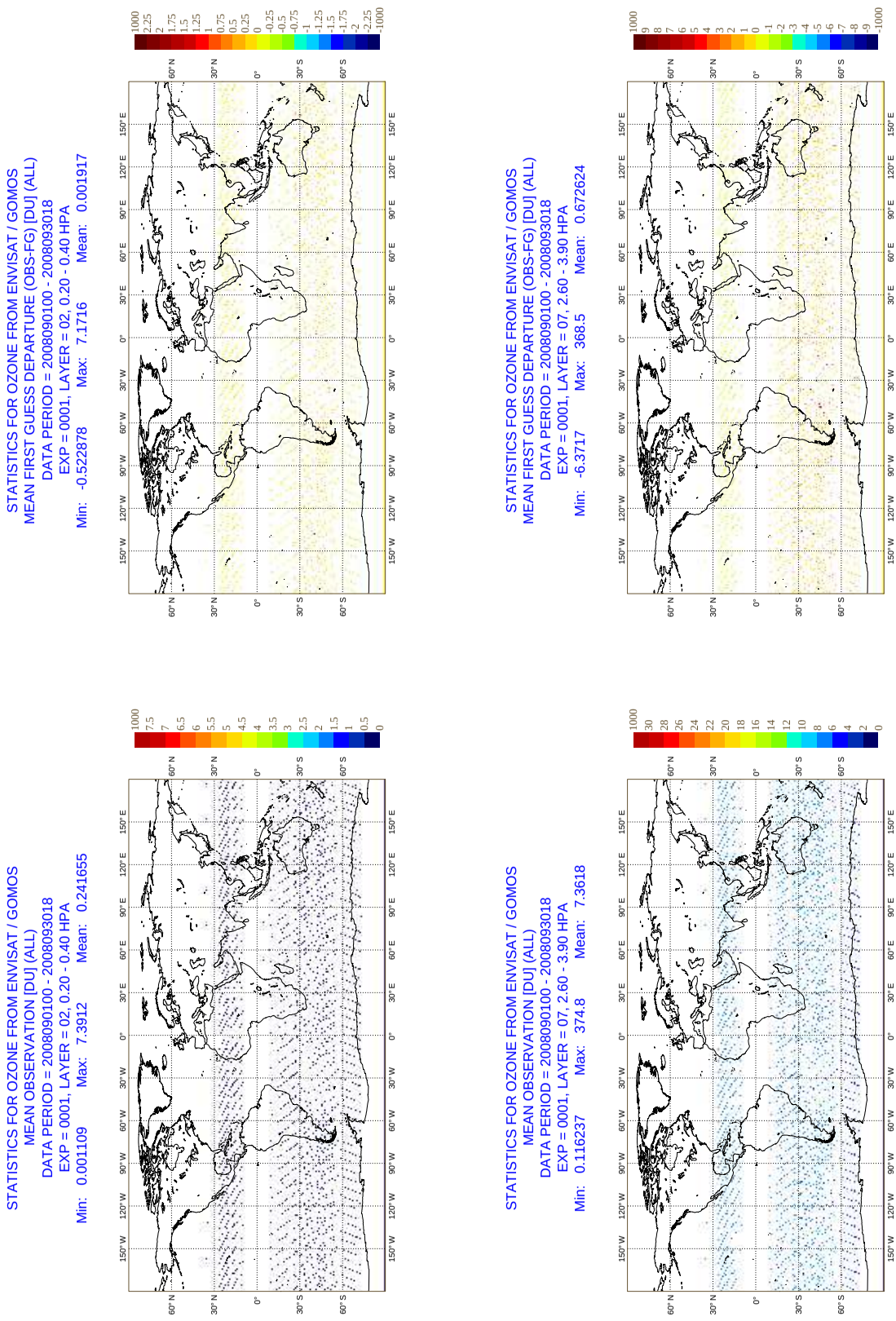


Fig. 21. Geographical distribution of mean ENVISAT GOMOS NRT ozone data and mean first-guess departures for September 2008 for layer 2 (0.2-0.4 hPa) and layer 7 (2.6-3.9 hPa).

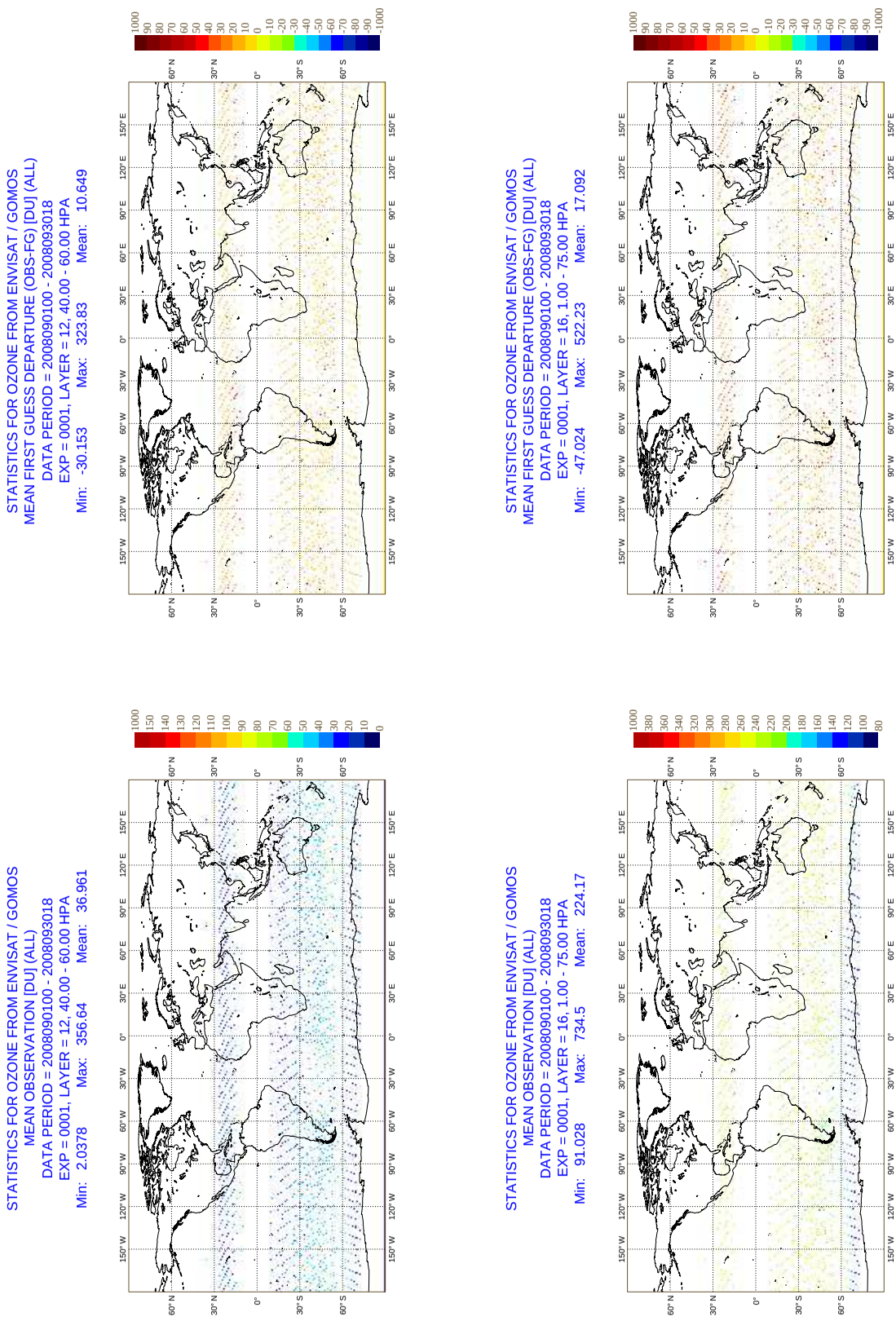


Fig. 22. As Fig. 21 but for layer 12 (40-60 hPa) and layer 16 (1-100 hPa).

REPORT ABOUT ENVISAT GOMOS NRT WATER VAPOUR DATA (GOM_RR__2P) FOR SEPTEMBER 2008

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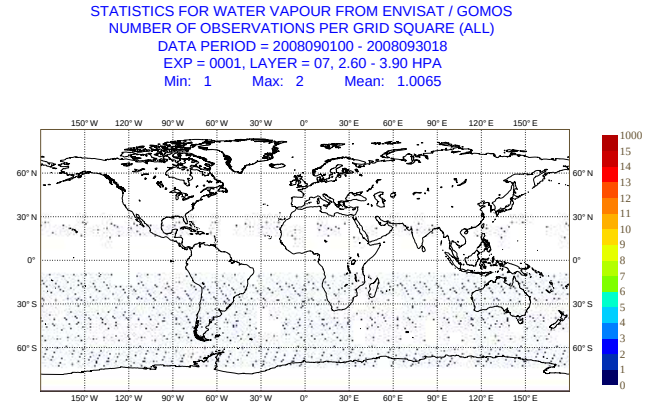

Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT water vapour data for level 7 (2.6-3.9 hPa) for September 2008.

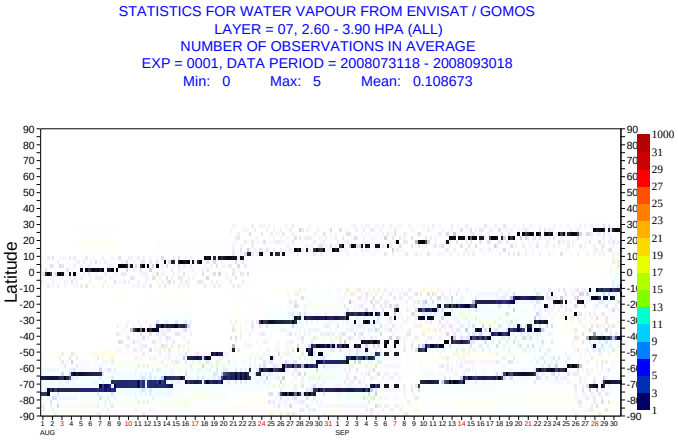

Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT water vapour data per 6-hour cycle for level 7 (2.6-3.9 hPa) for August-September 2008.

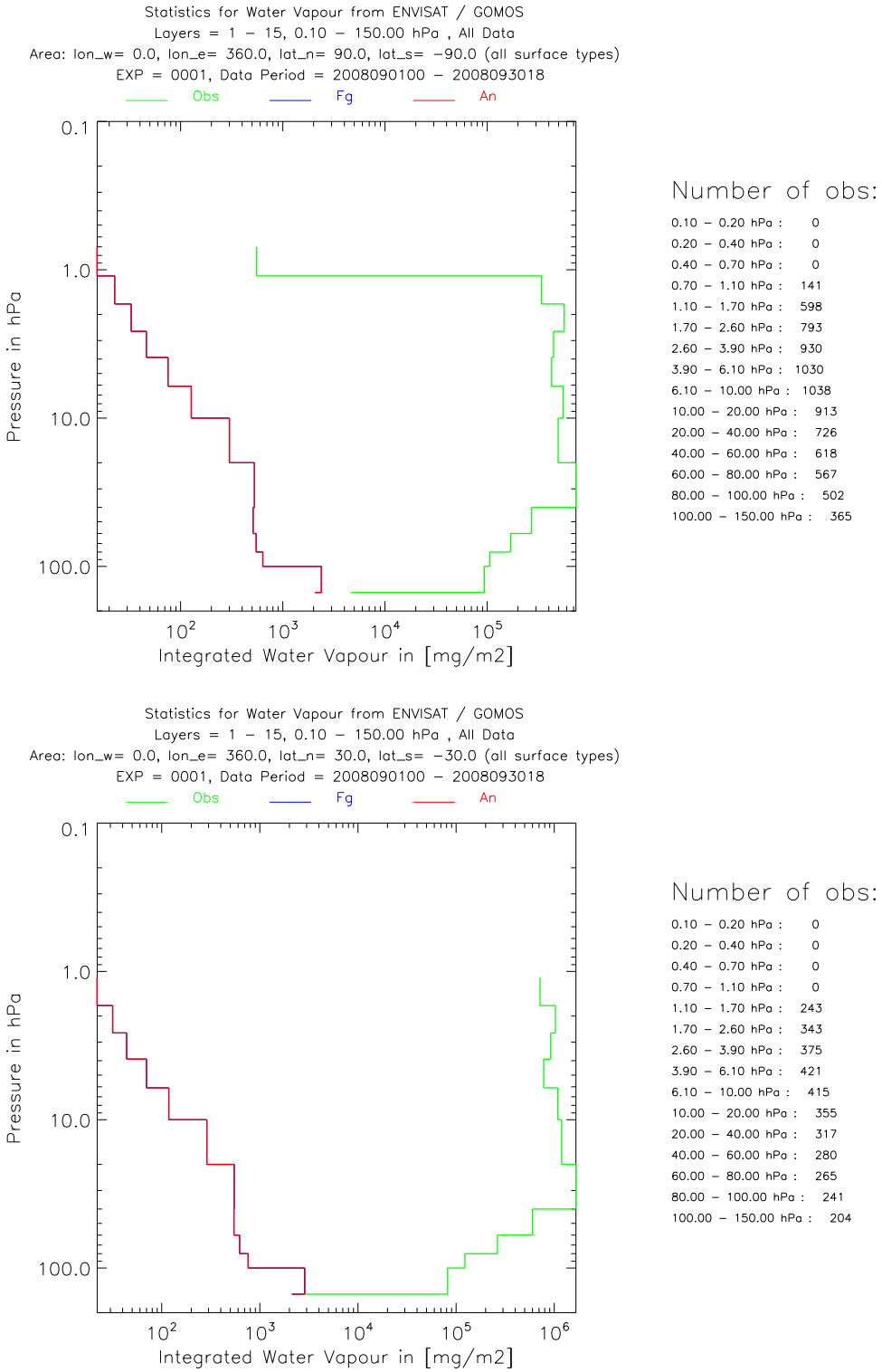

Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT water vapour data in mg/m^2 for September 2008. The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (green) globally averaged. The bottom plot shows a similar plot for the tropical band (30N-30S) Plotted are the partial columns for the 16 levels listed to the right of the diagrams.

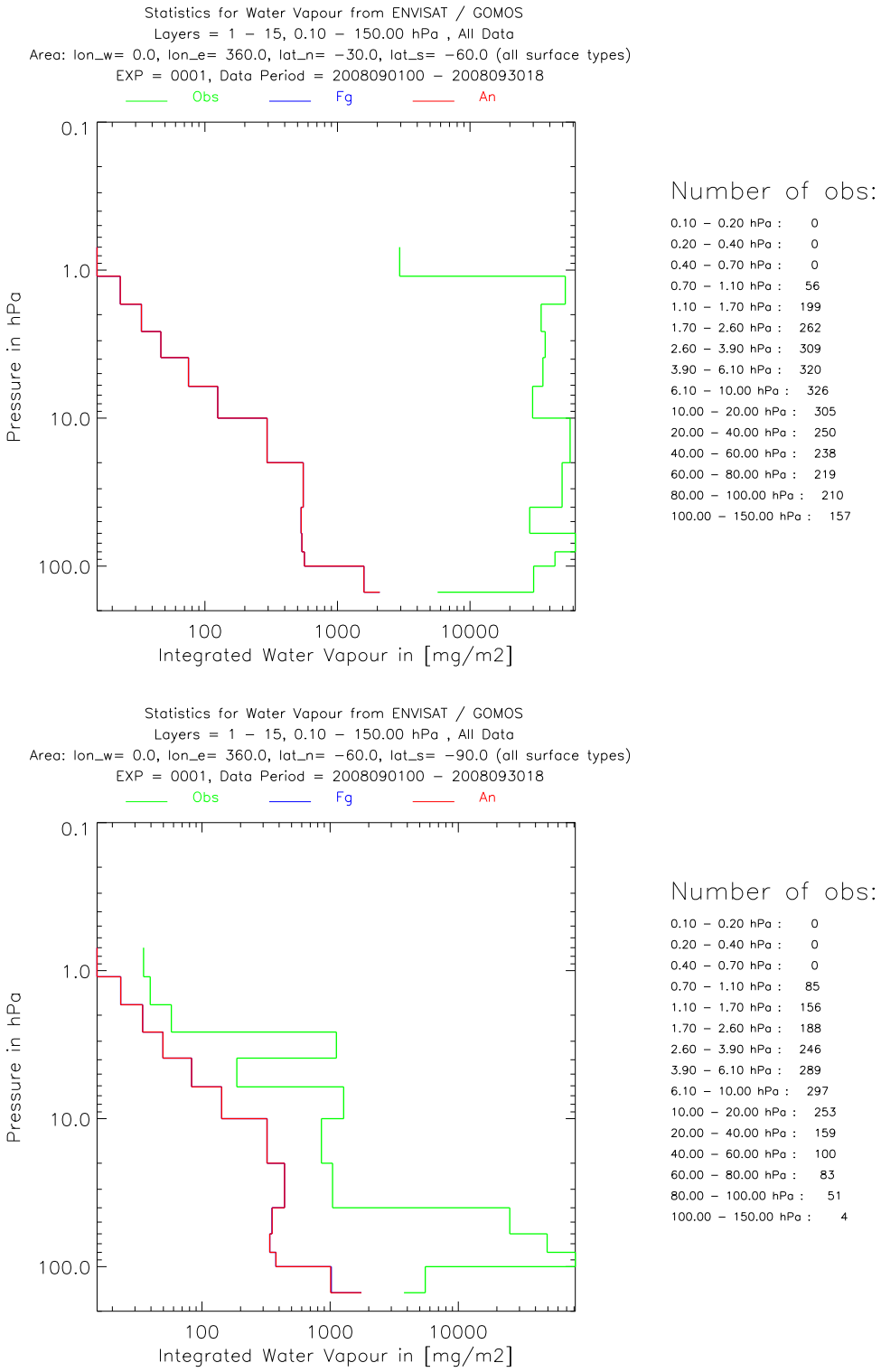

Fig. 4. As Fig. 3 but for 30-60S (top panel) and 60-90S (bottom panel).

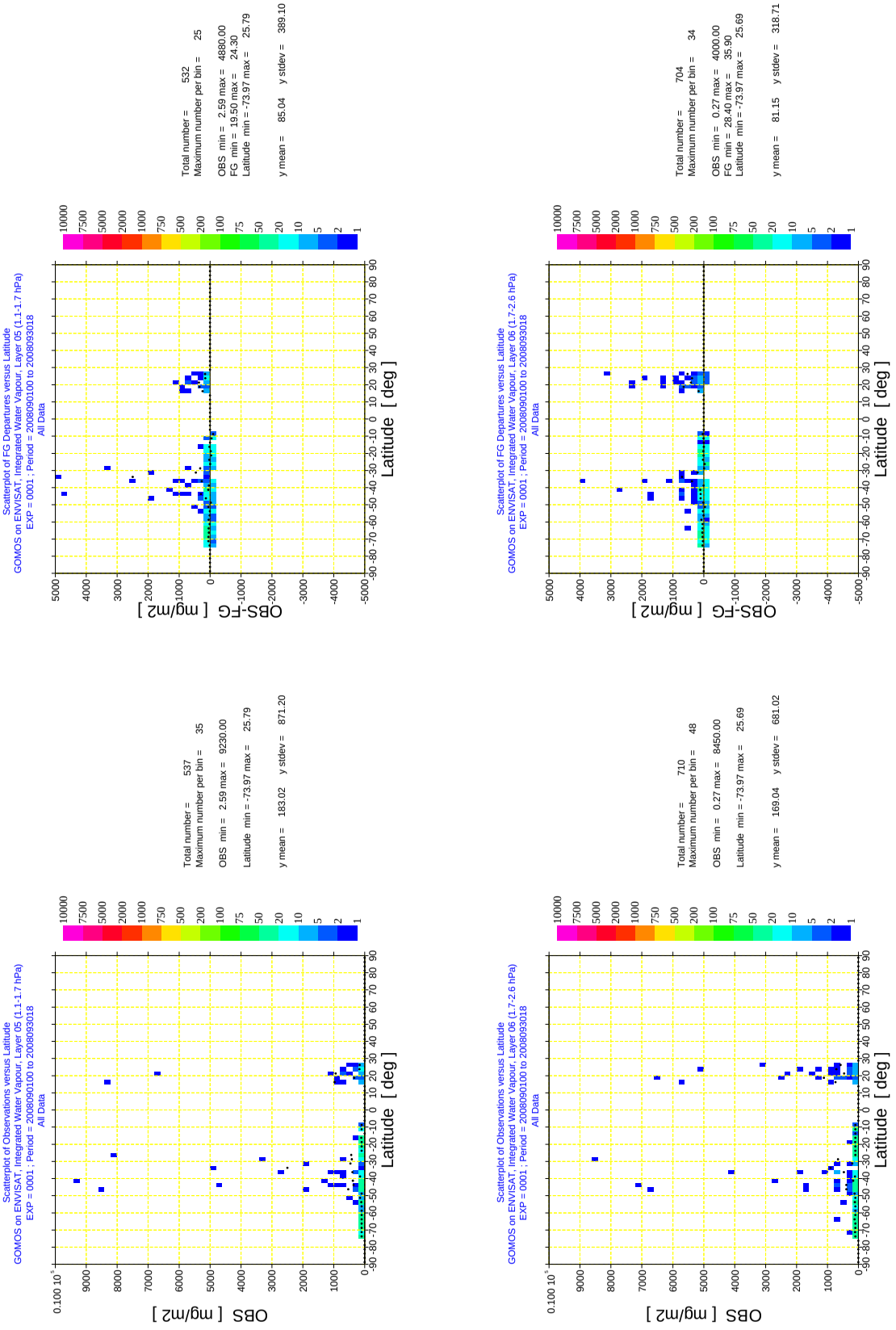

Fig. 5. Scatter plot of ENVISAT GOMOS NRT water vapour data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT water vapour data against latitude (right) for September 2008 for level 5 (1.1 hPa) and level 6 (1.7 hPa). The colours show the number of data per bin, and the black dots the mean value per bin.

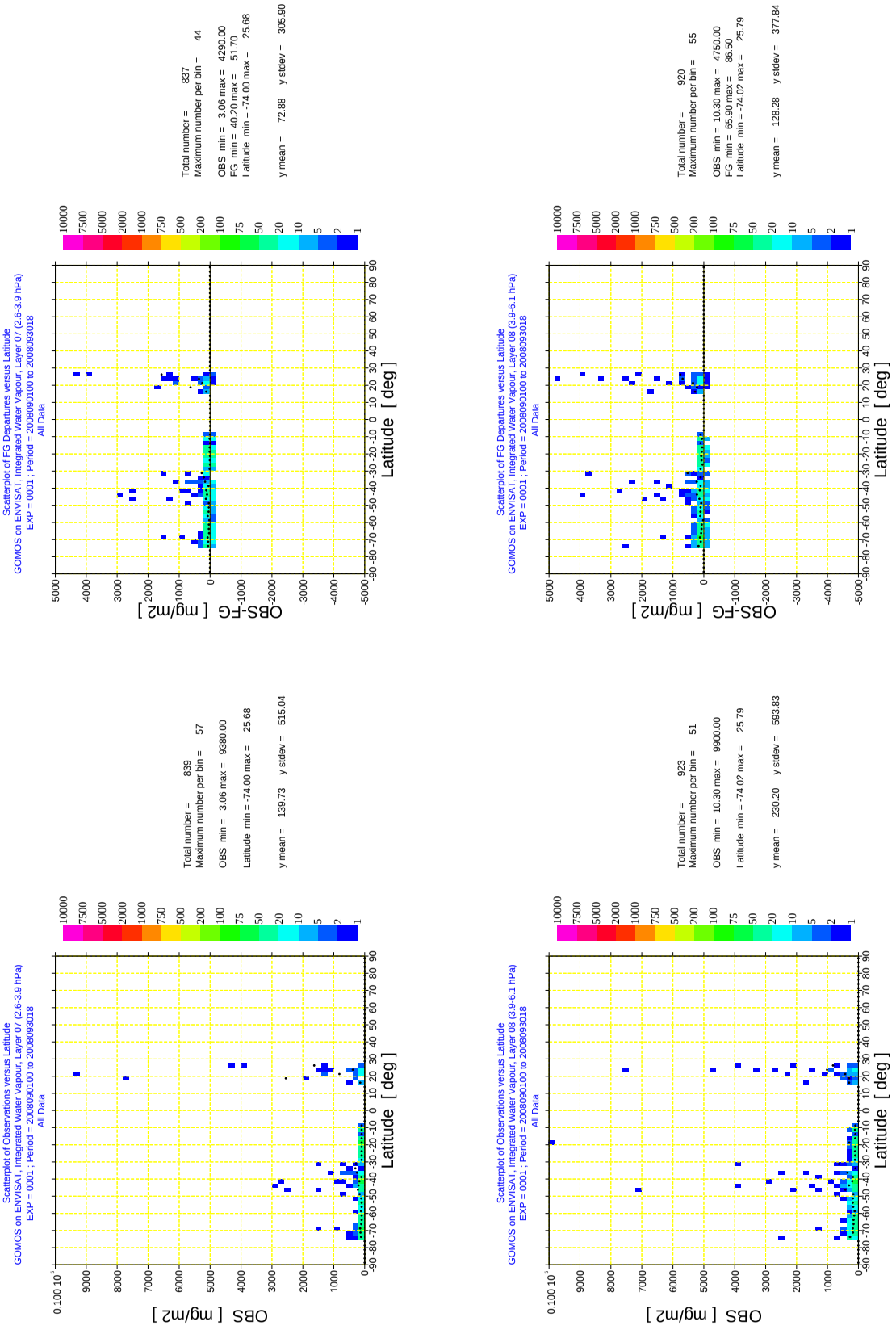

Fig. 6. As Fig. 5 but for level 7 (2.6 hPa) and level 8 (3.9 hPa).

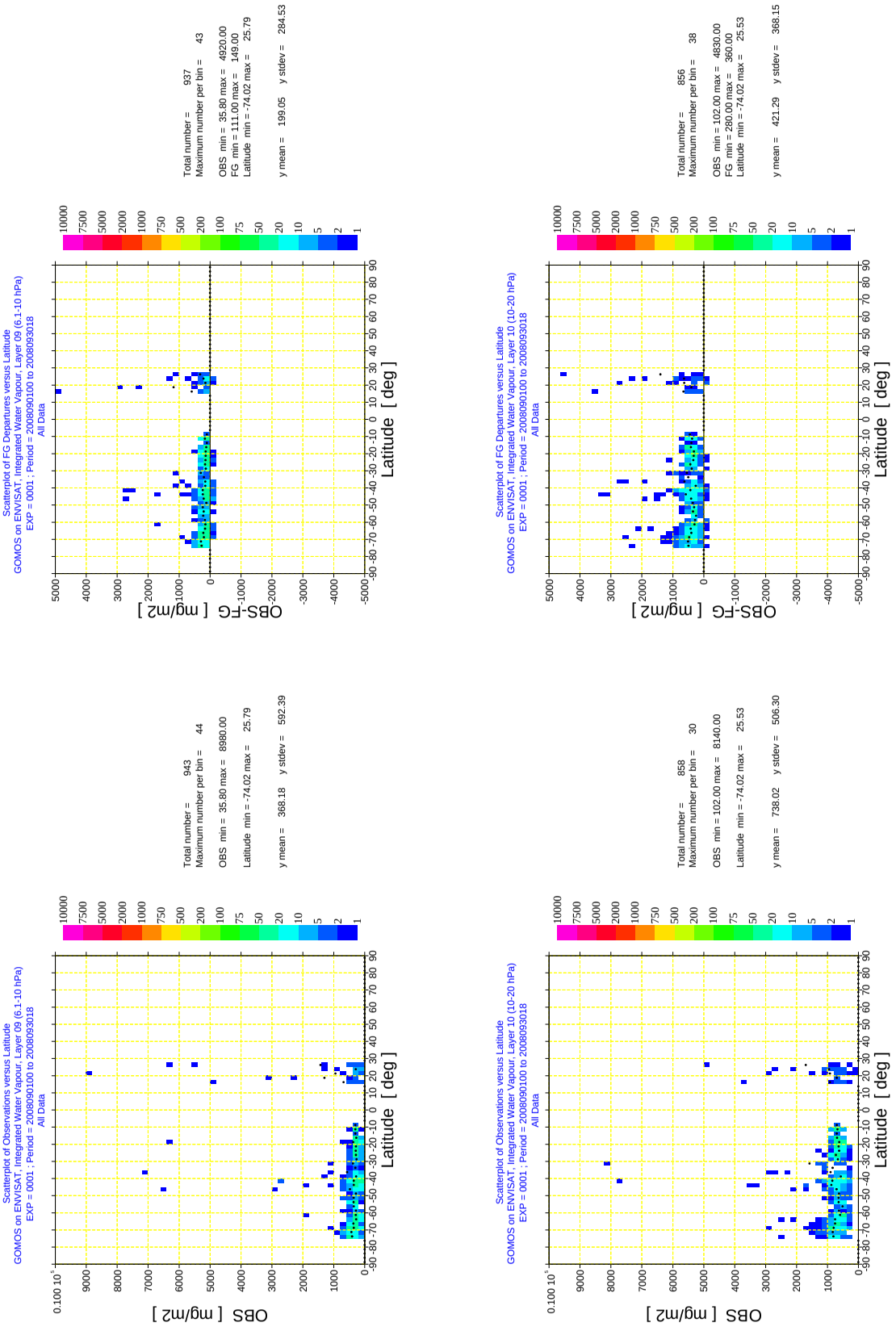

Fig. 7. As Fig. 5 but for level 9 (6.1 hPa) and level 10 (10 hPa).

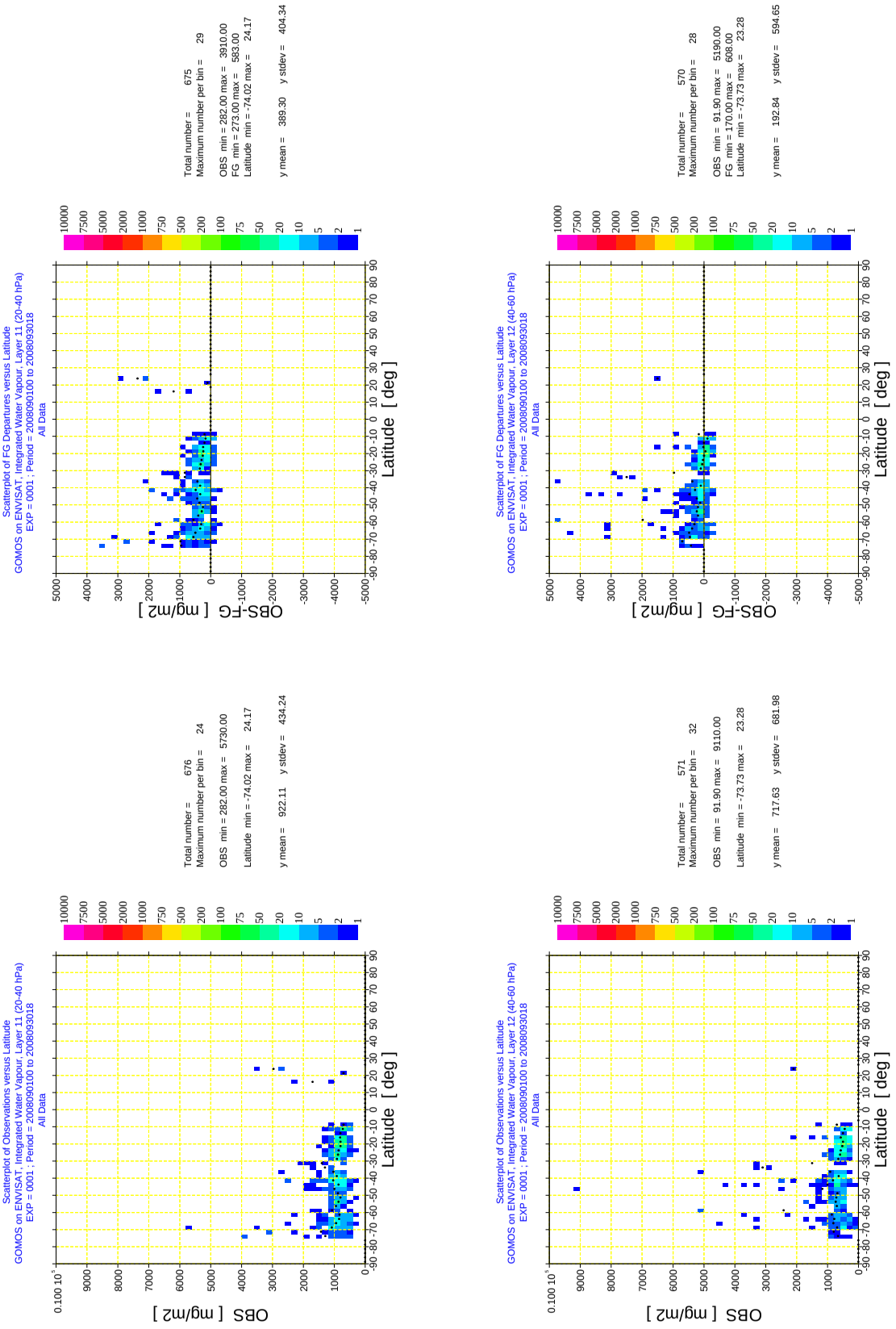

Fig. 8. As Fig. 5 but for level 11 (20-40 hPa) and level 12 (40-60 hPa).

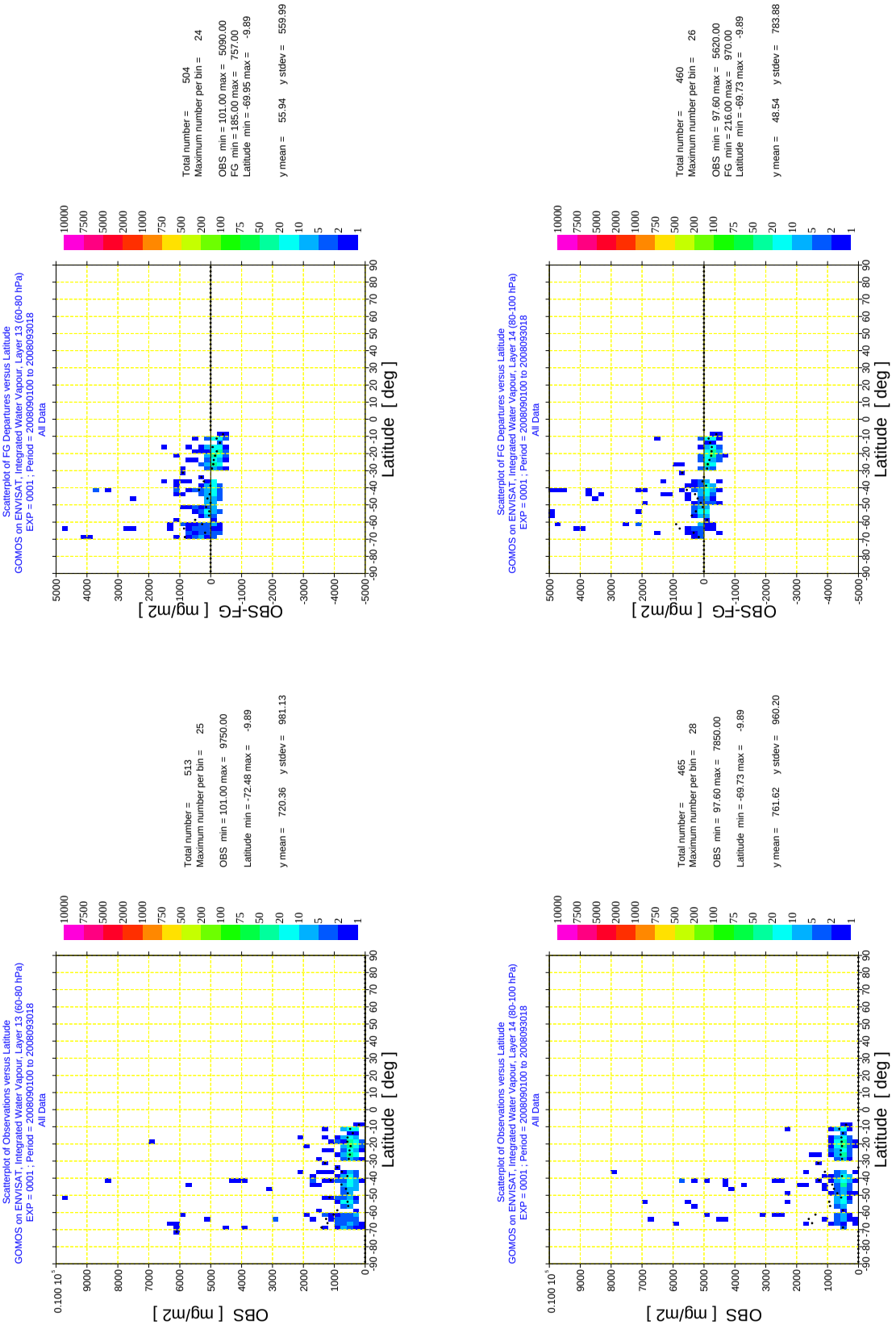

Fig. 9. As Fig. 5 but for level 13 (60-80 hPa) and level 14 (80-100 hPa).

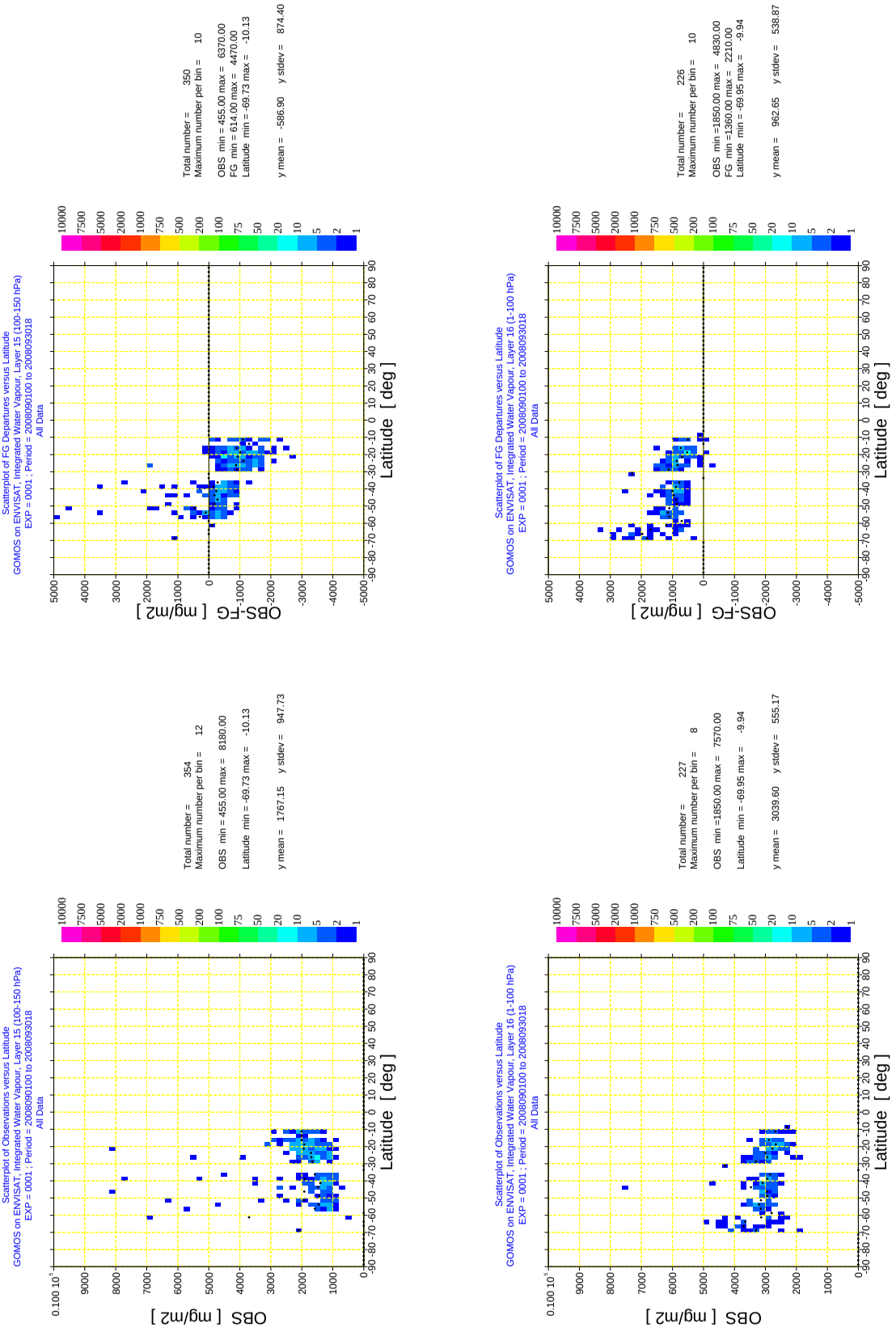

Fig. 10. As Fig. 5 but for level 15 (100-150 hPa) and level 16 (1-100 hPa).

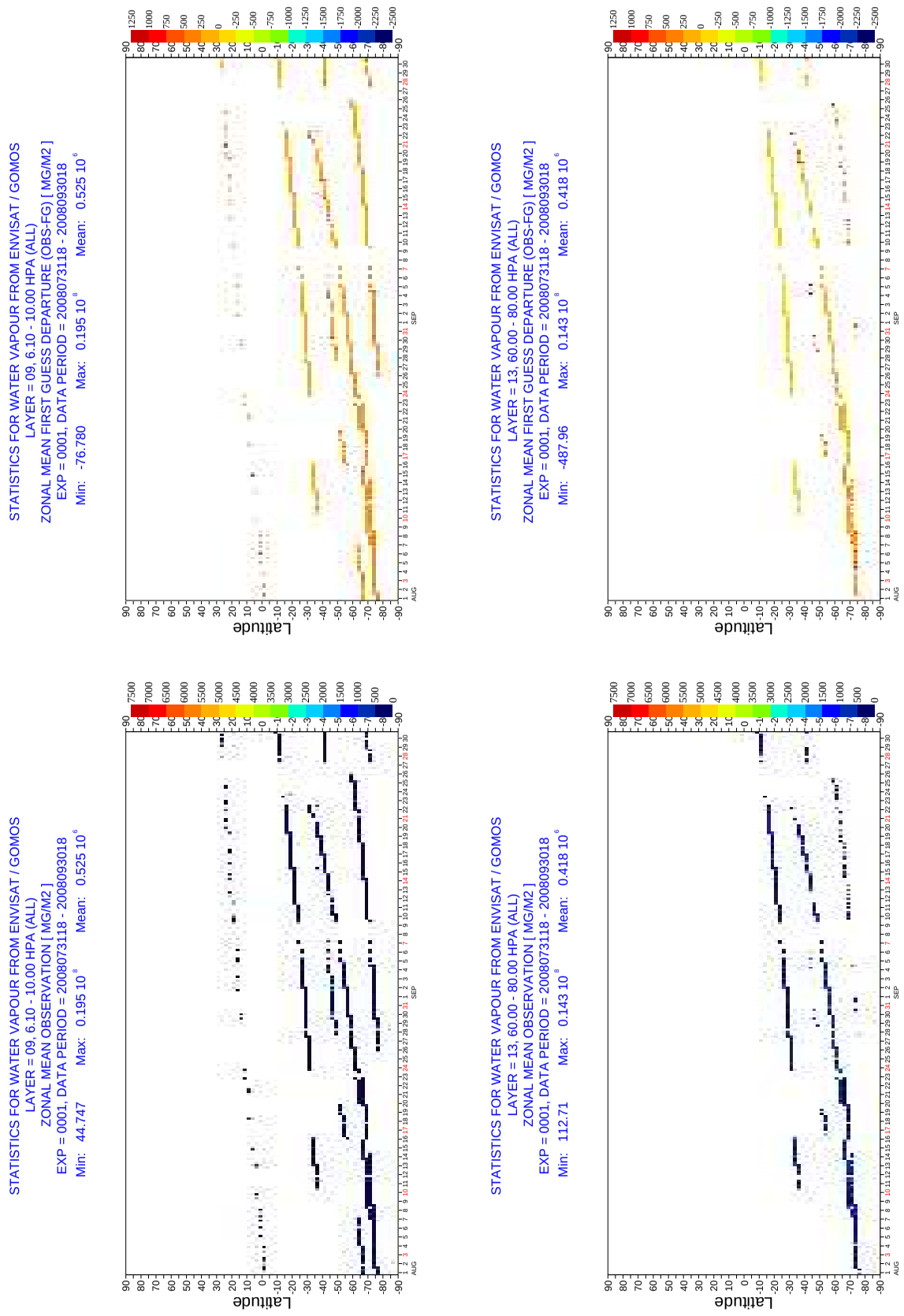

Fig. 11. Hovmoeller diagram of zonal mean ENVISAT GOMOS NRT water vapour data per 6-hour cycle and of the zonal mean first-guess departures for level 13 (60-80 hPa) and level 15 (100-150 hPa) for August-September 2008.

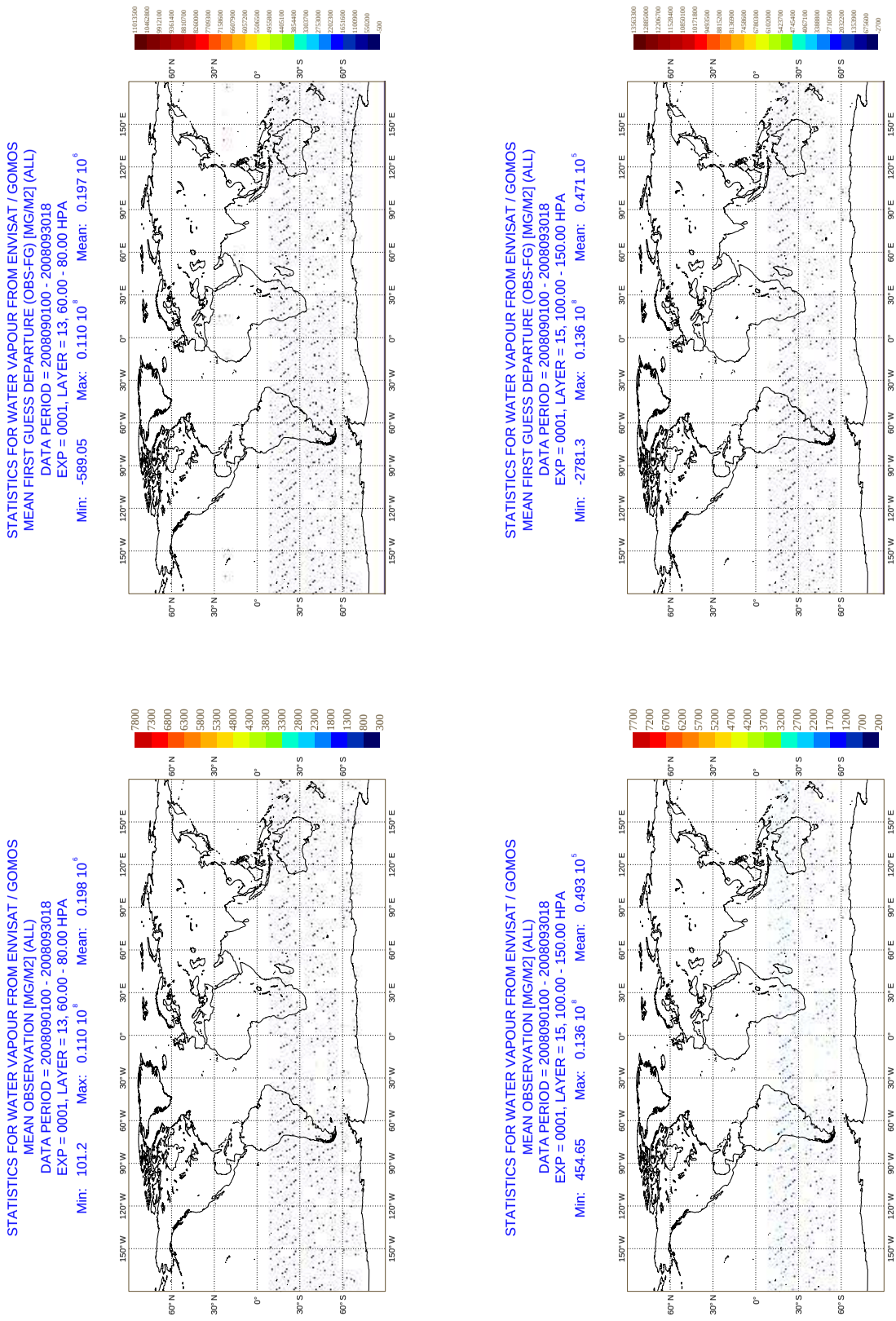

Fig. 12. Geographical distribution of mean ENVISAT GOMOS NRT water vapour data and mean first-guess departures for level 13 (60-80 hPa) and level 15 (100-150 hPa) for September 2008.

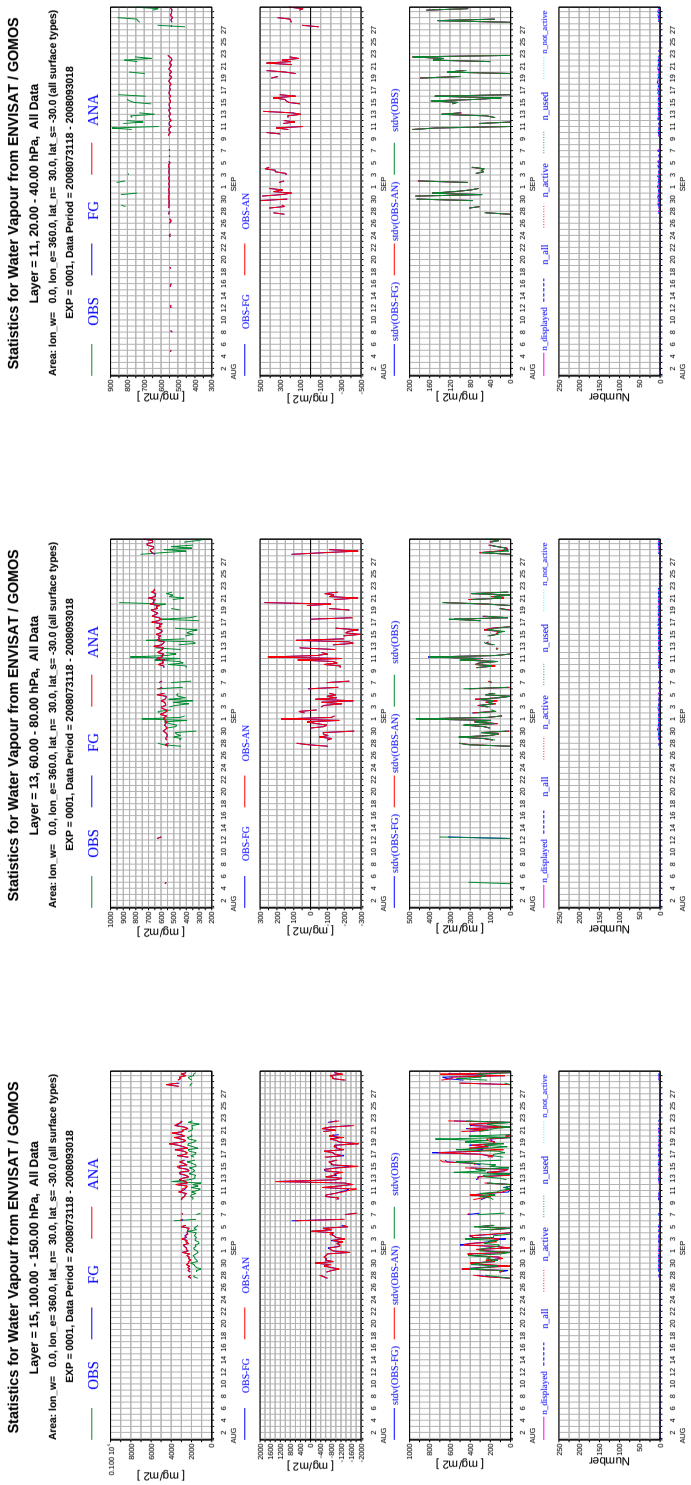

Fig. 13. Timeseries of mean ENVISAT GOMOS NRT water vapour data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for layer 11 (20-40 hPa), level 13 (60-80 hPa), and level 15 (100-150 hPa) in the latitudinal band 30N-30S for the period August-September 2008.

REPORT ABOUT ENVISAT GOMOS NRT TEMPERATURE DATA (GOM_RR__2P) FOR SEPTEMBER 2008

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October 8, 2008

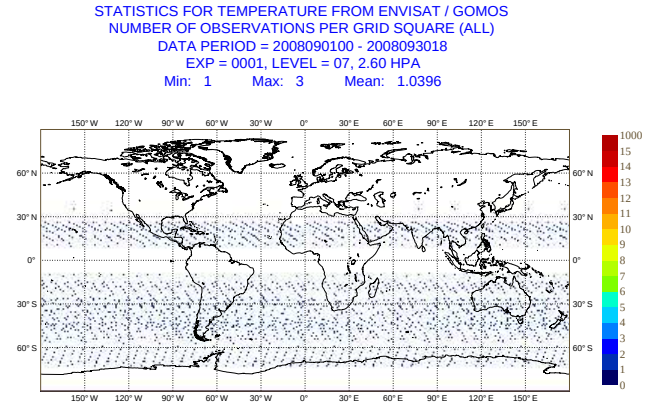


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT temperature data for level 7 (2.6 hPa) for September 2008.

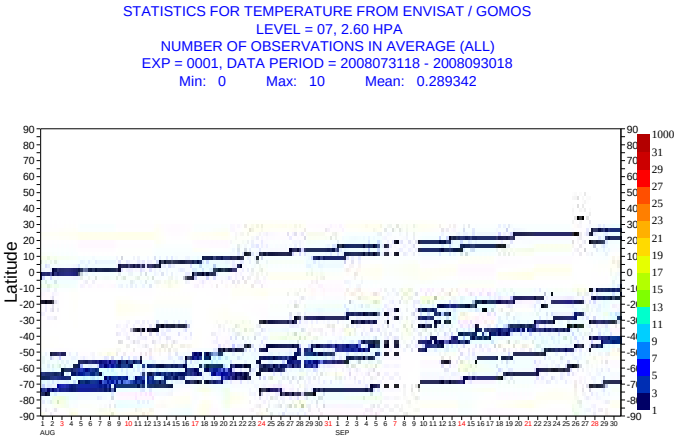


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT temperature data per 6-hour cycle for level 7 (2.6 hPa) for August-September 2008.

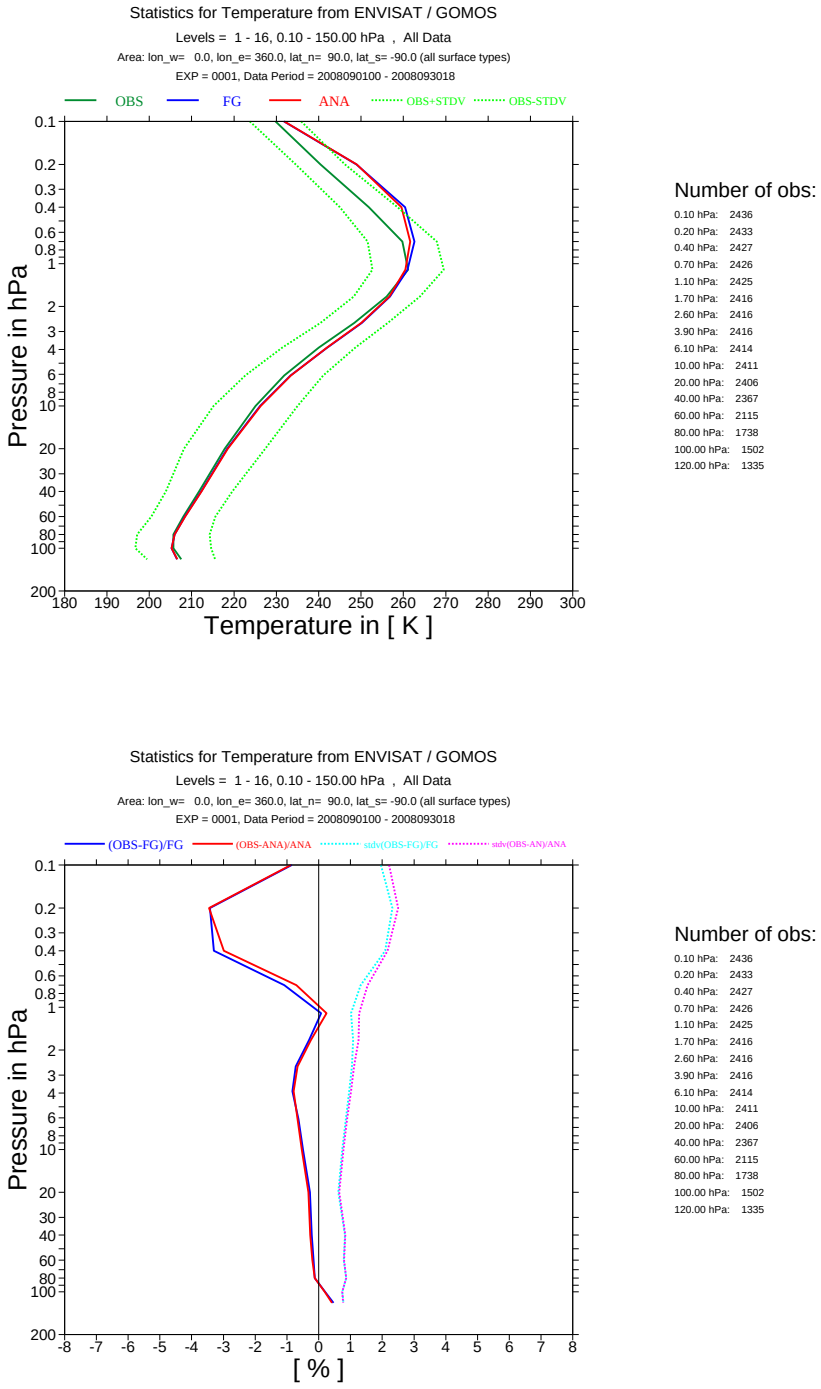
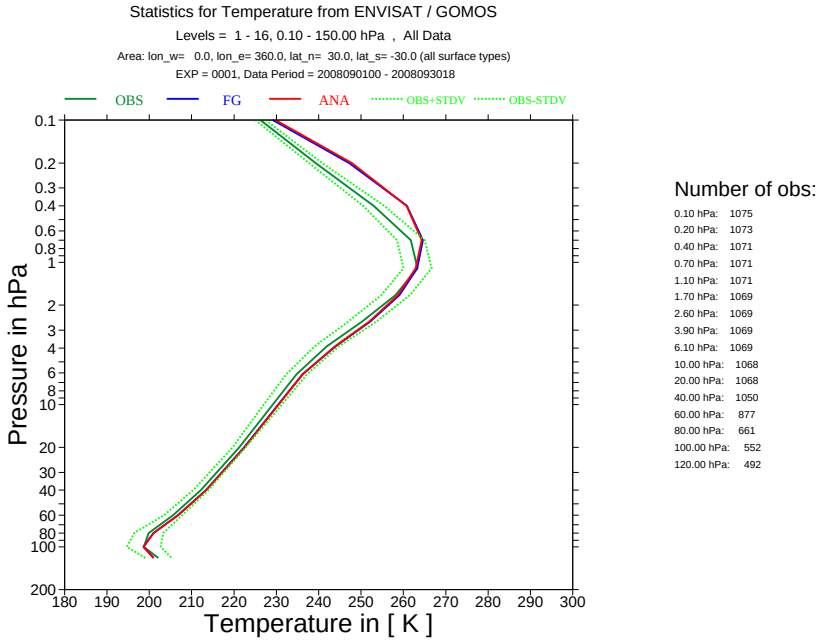


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT temperature data in K for September 2008 (global mean). The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (green), and the mean observation +/- 1 standard deviation (green dotted lines). The bottom plot shows the departures and the standard deviation of the departures in %. Plotted are the values for the 16 levels listed to the right of the diagrams.



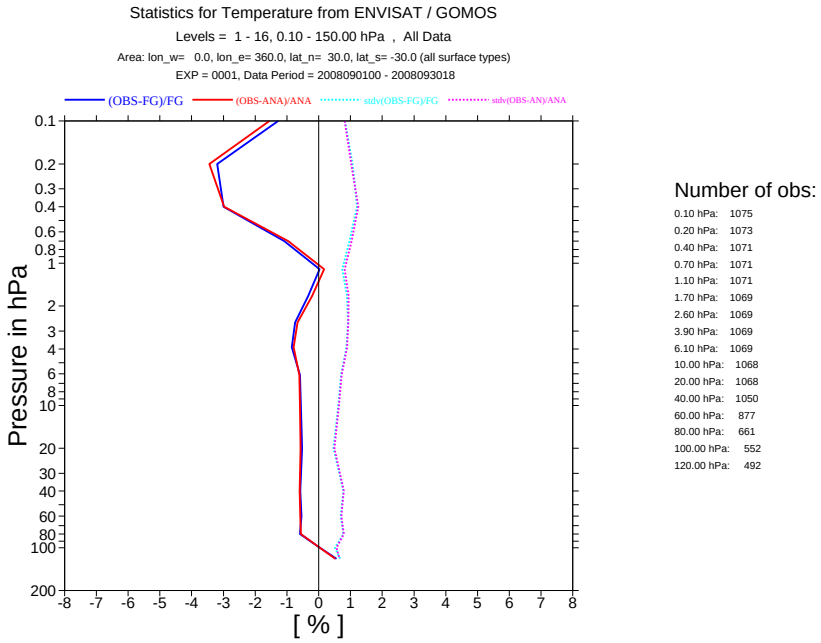
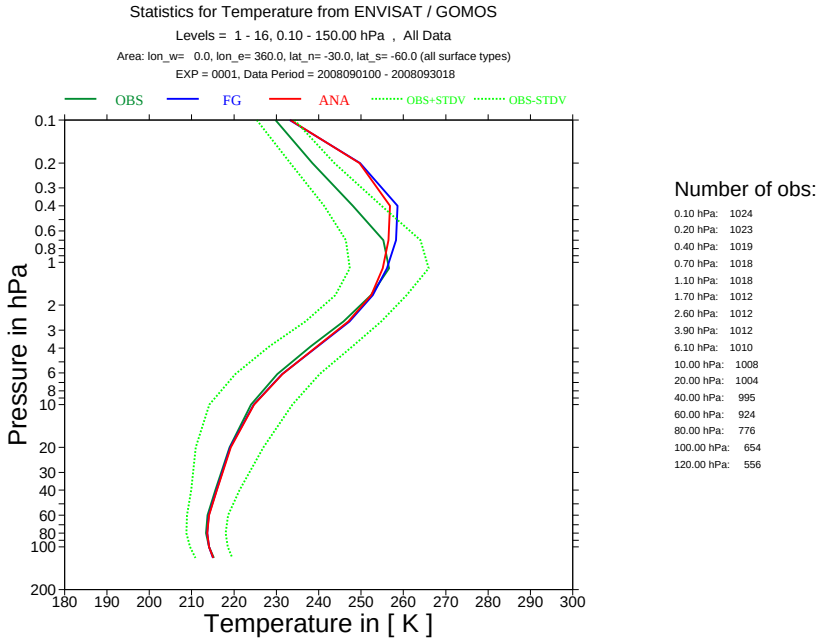


Fig. 4. As Fig. 3 but for 30N-30S.



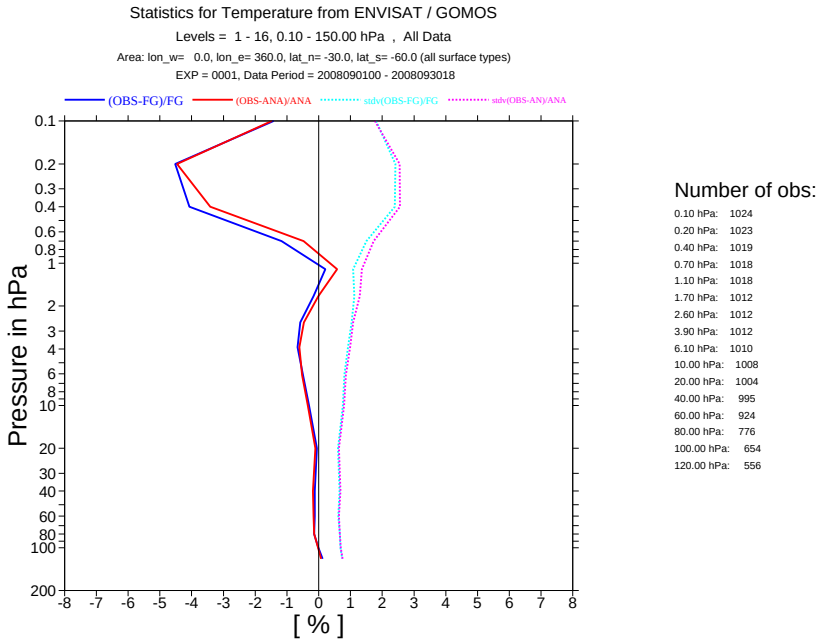
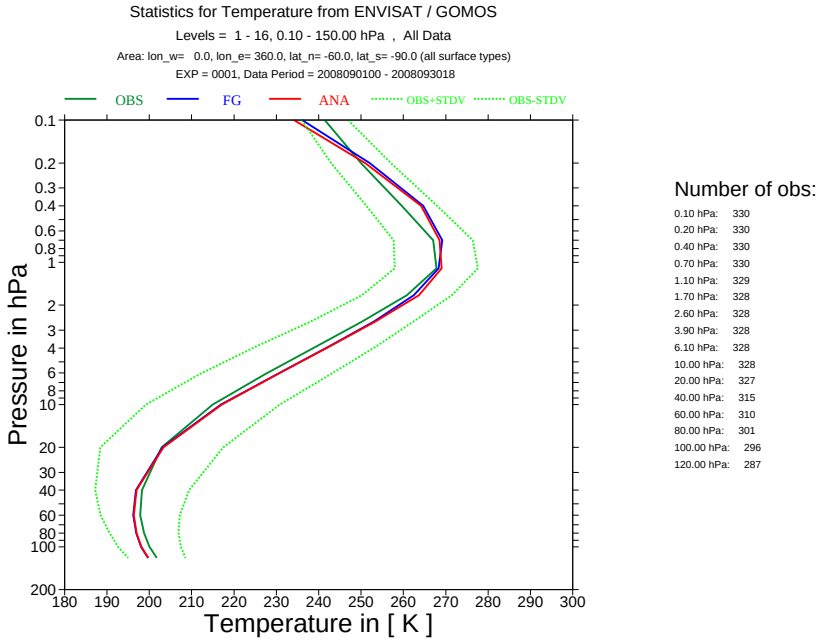


Fig. 5. As Fig. 3 but for 30-60S.



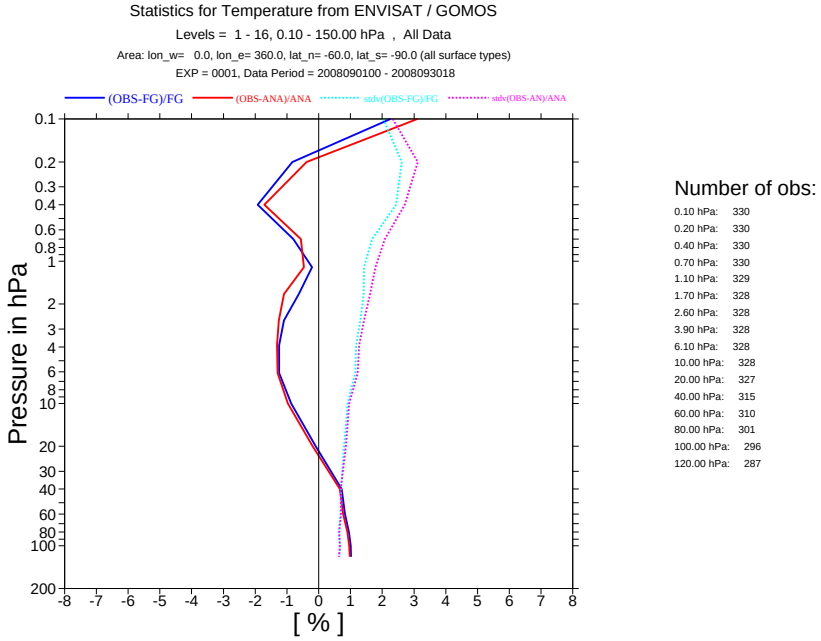


Fig. 6. As Fig. 3 but for 60-90S.

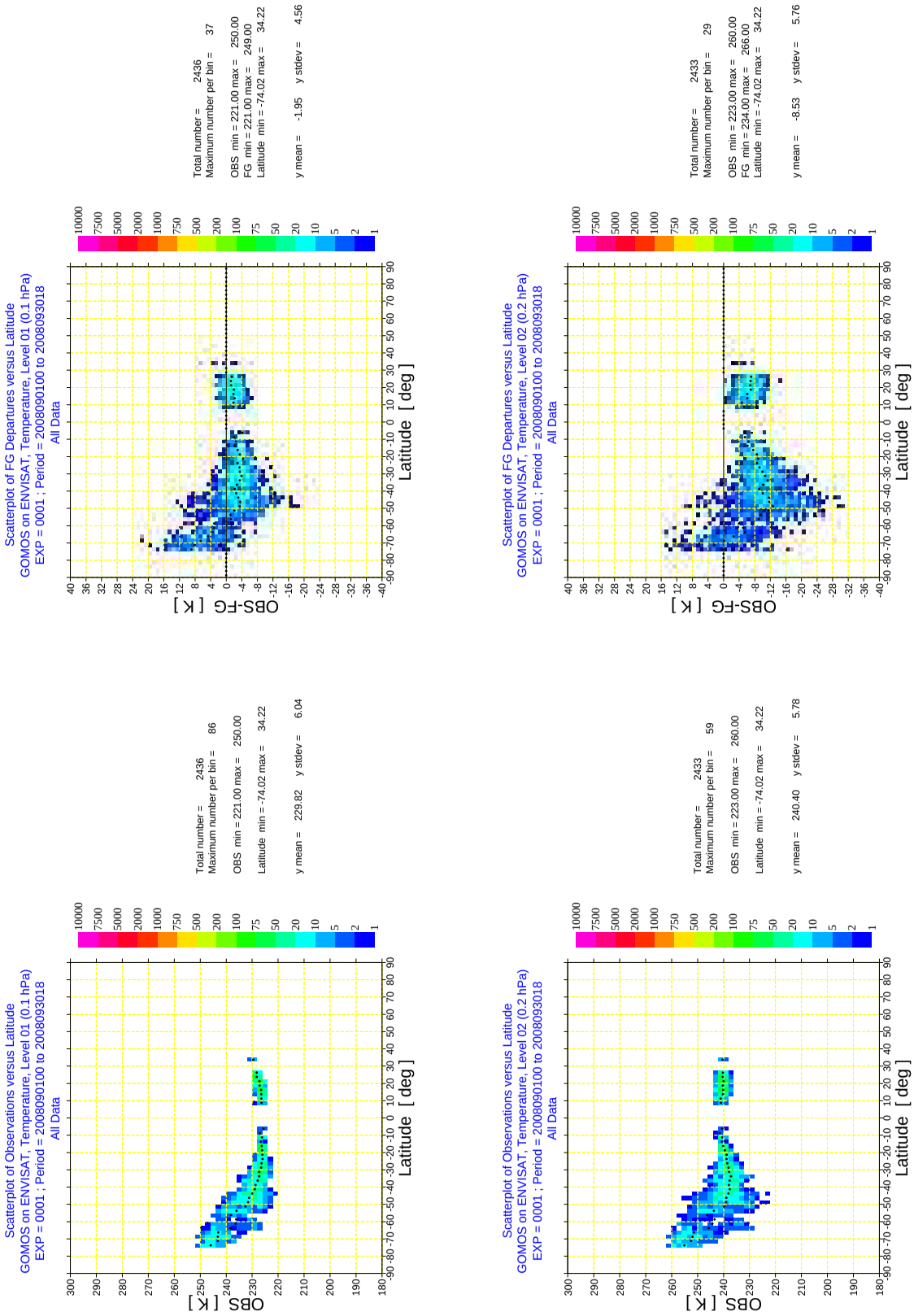


Fig. 7. Scatter plot of ENVISAT GOMOS NRT temperature data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT temperature data against latitude (right) for September 2008 for level 1 (0.1 hPa) and level 2 (0.2 hPa). The colours show the number of data per bin, and the black dots the mean value per bin.

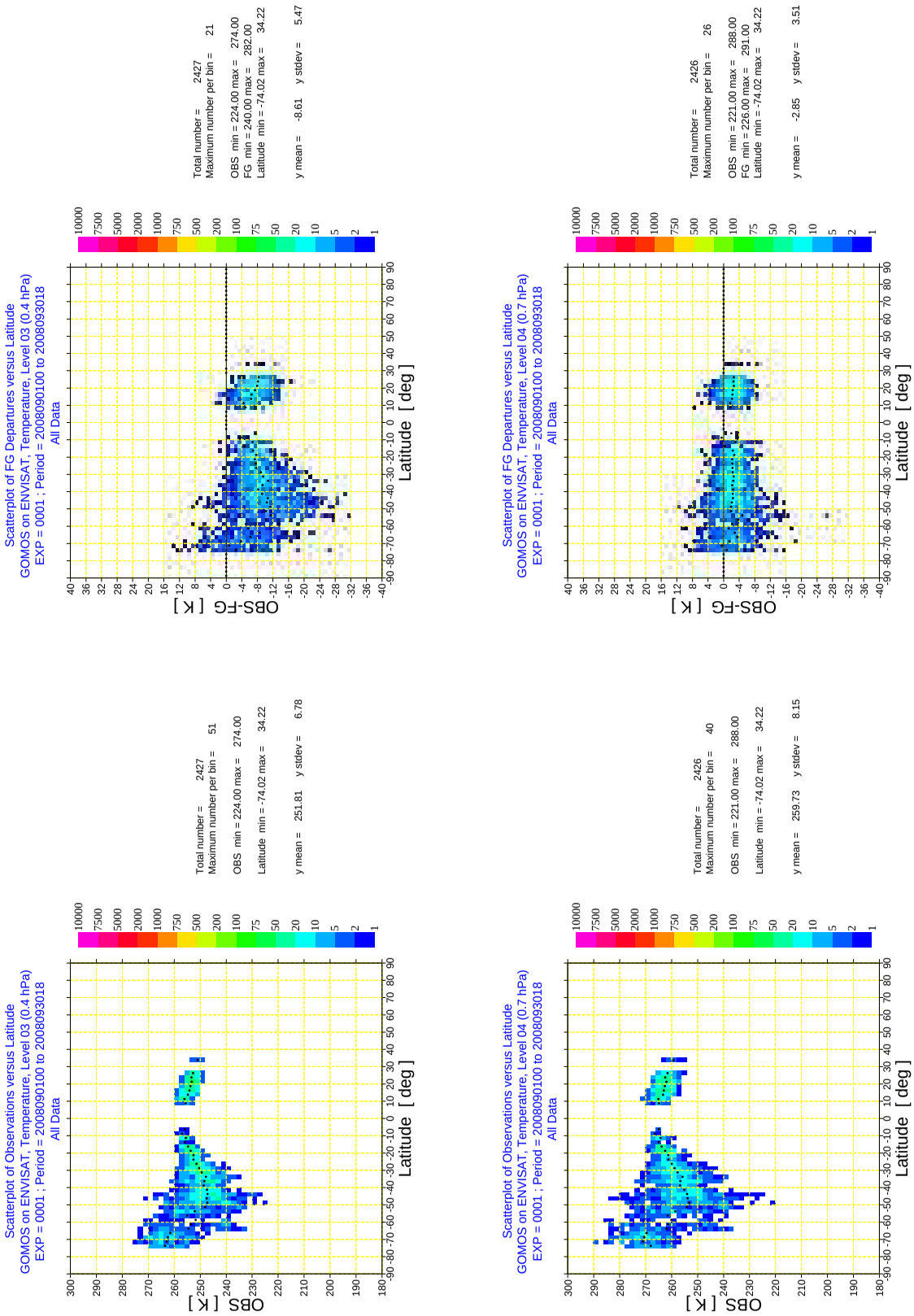


Fig. 8. As Fig. 7 but for level 3 (0.4 hPa) and level 4 (0.7 hPa).

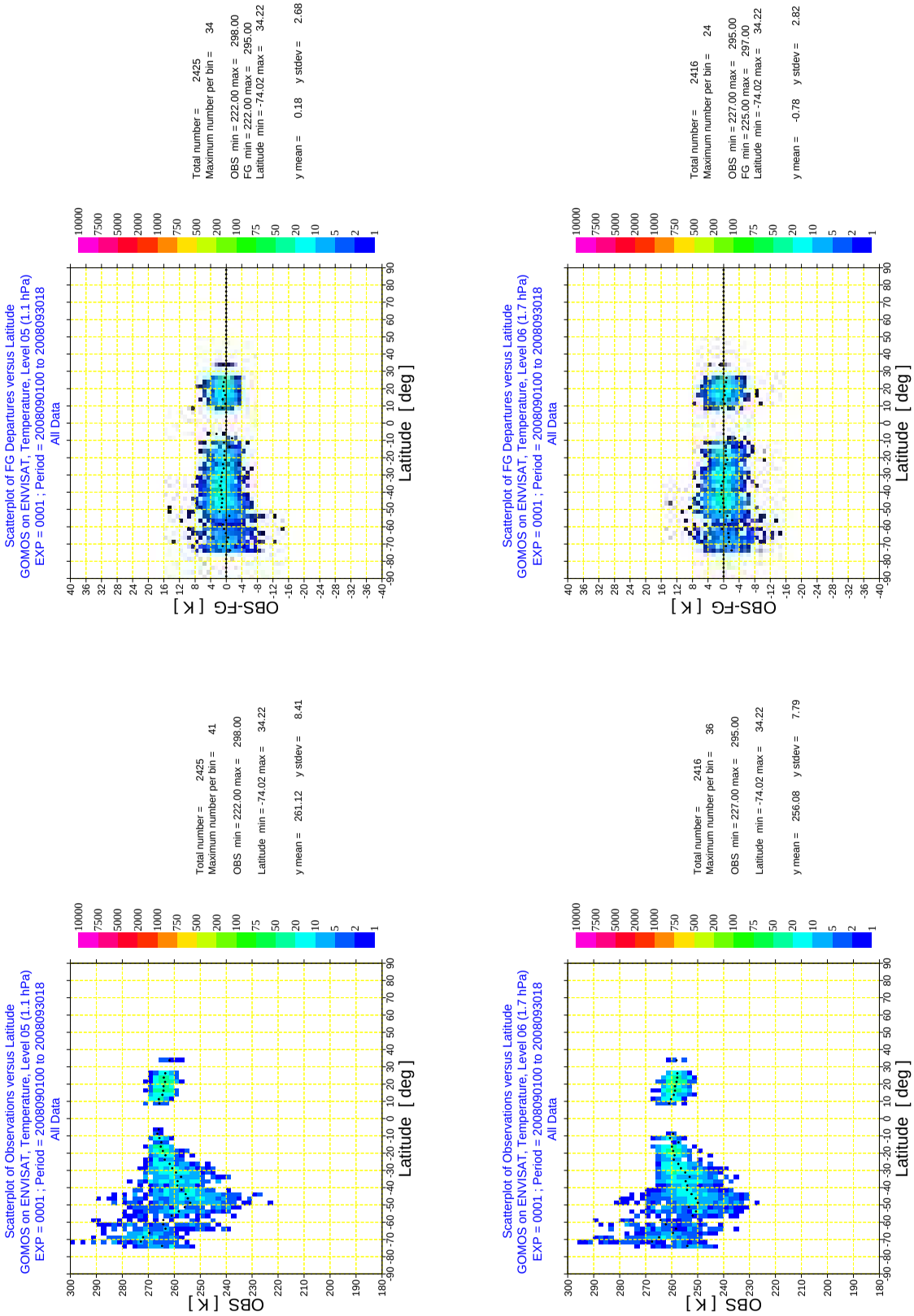


Fig. 9. As Fig. 7 but for level 5 (1.1 hPa) and level 6 (1.7 hPa).

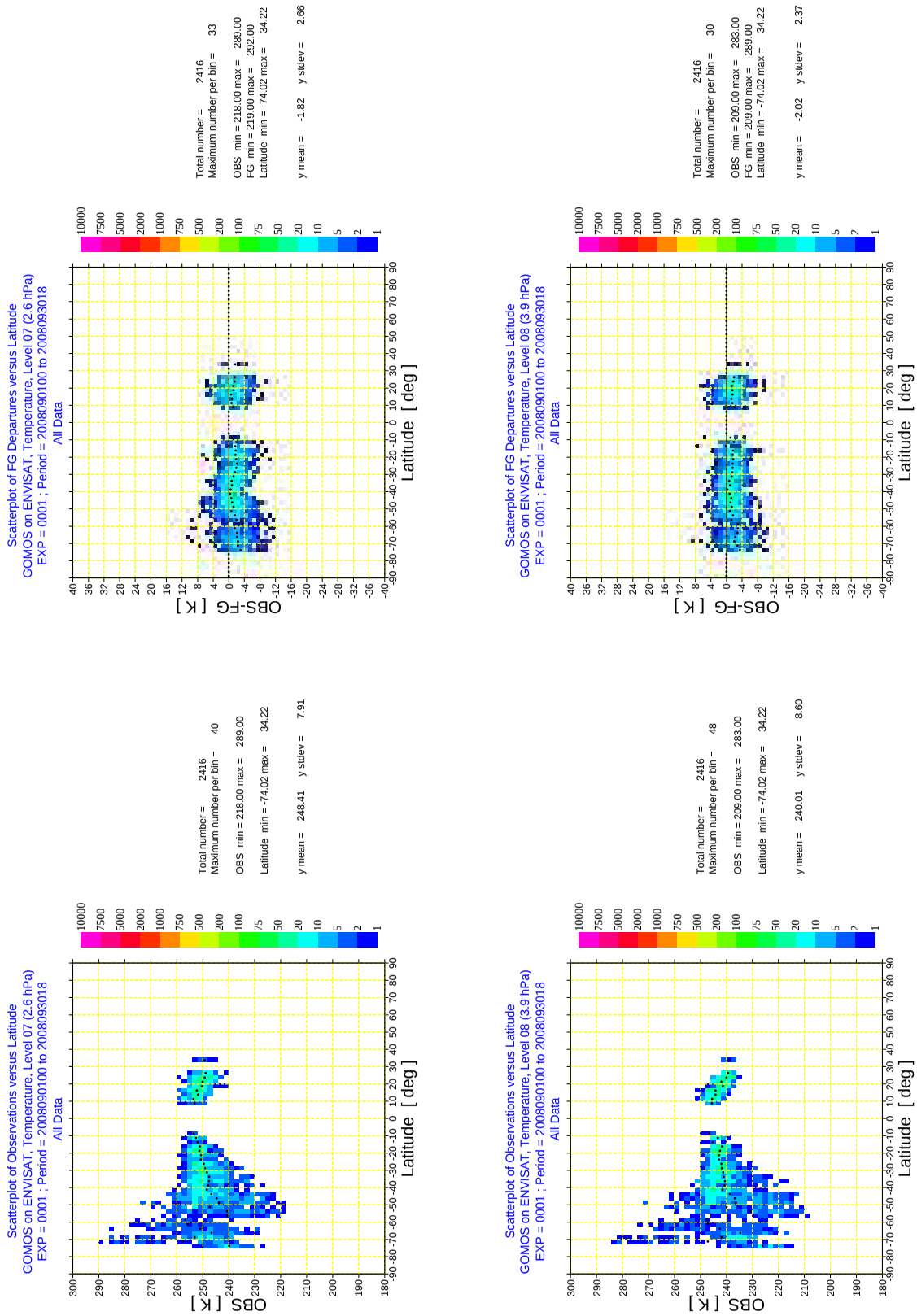


Fig. 10. As Fig. 7 but for level 7 (2.6 hPa) and level 8 (3.9 hPa).

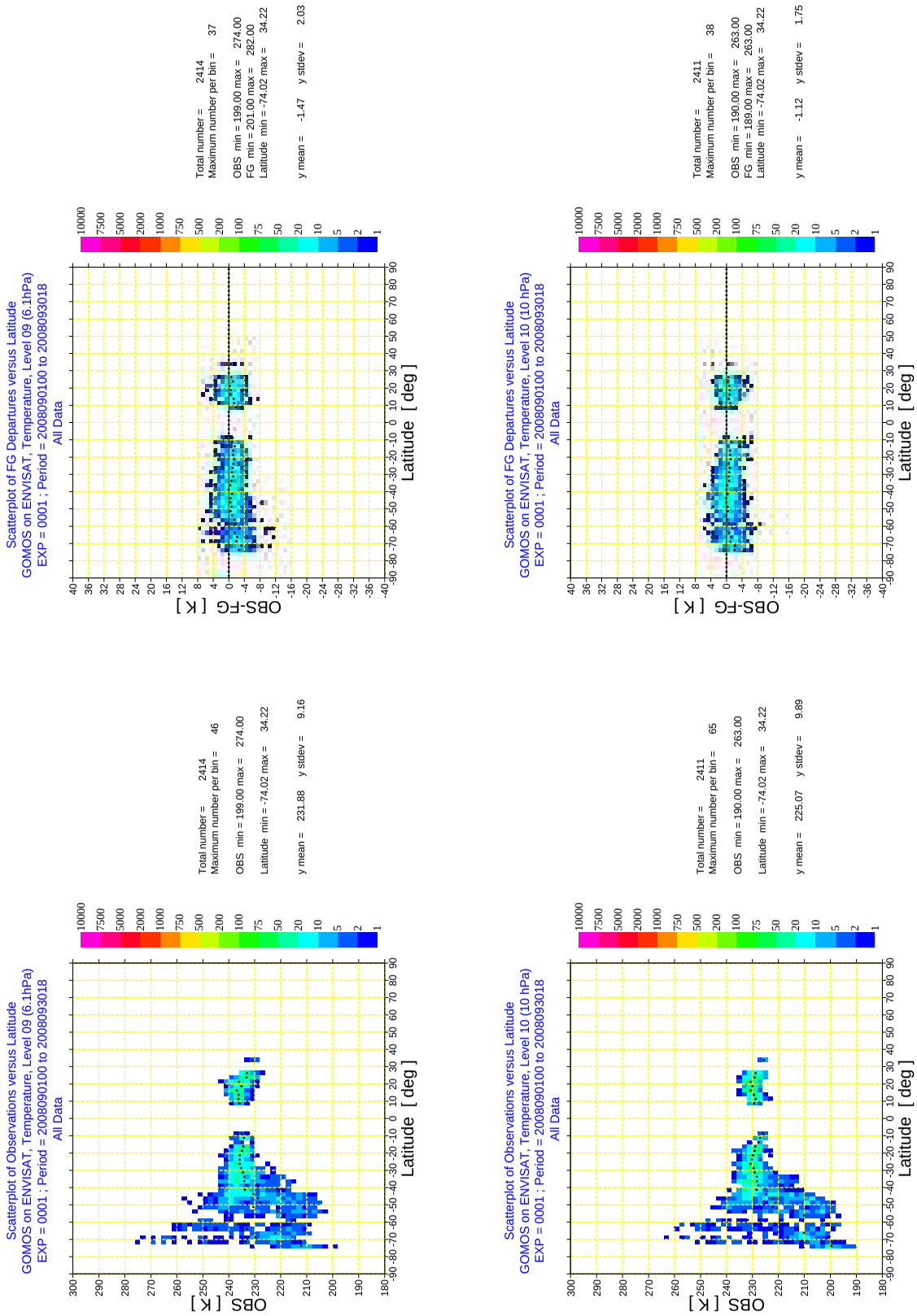


Fig. 11. As Fig. 7 but for level 9 (6.1 hPa) and level 10 (10 hPa).

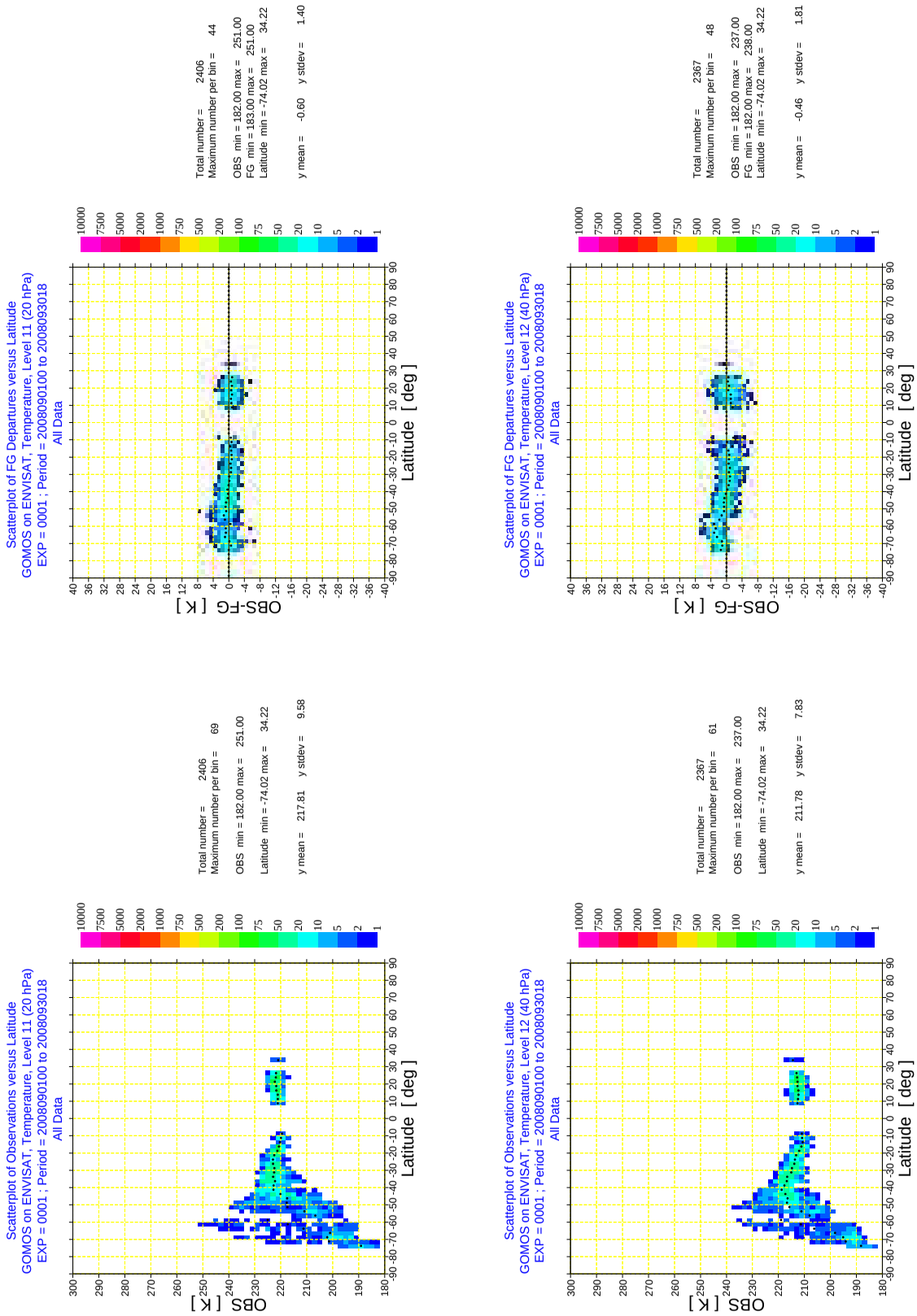


Fig. 12. As Fig. 7 but for level 11 (20 hPa) and level 12 (40 hPa).

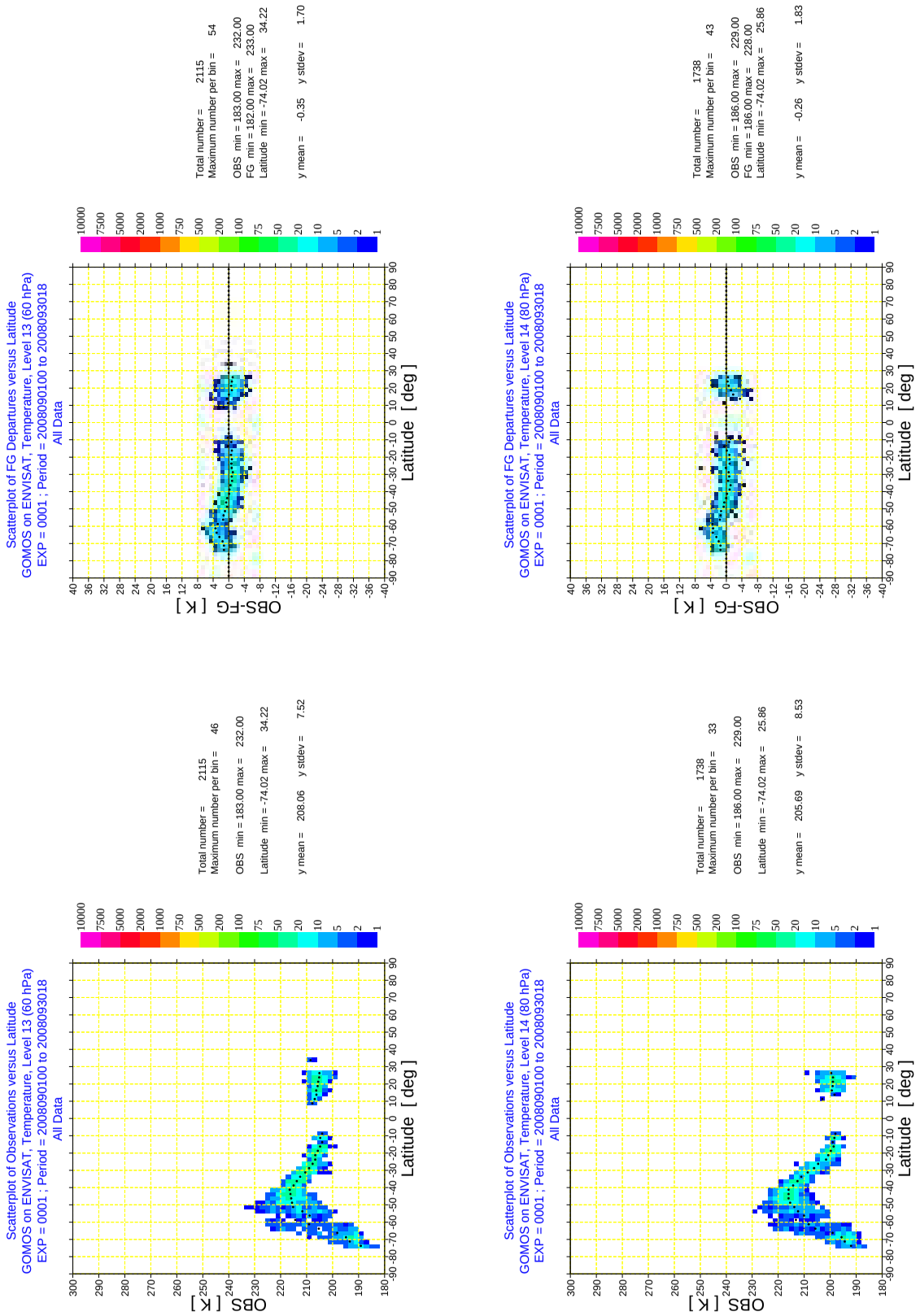


Fig. 13. As Fig. 7 but for level 13 (60 hPa) and level 14 (80 hPa).

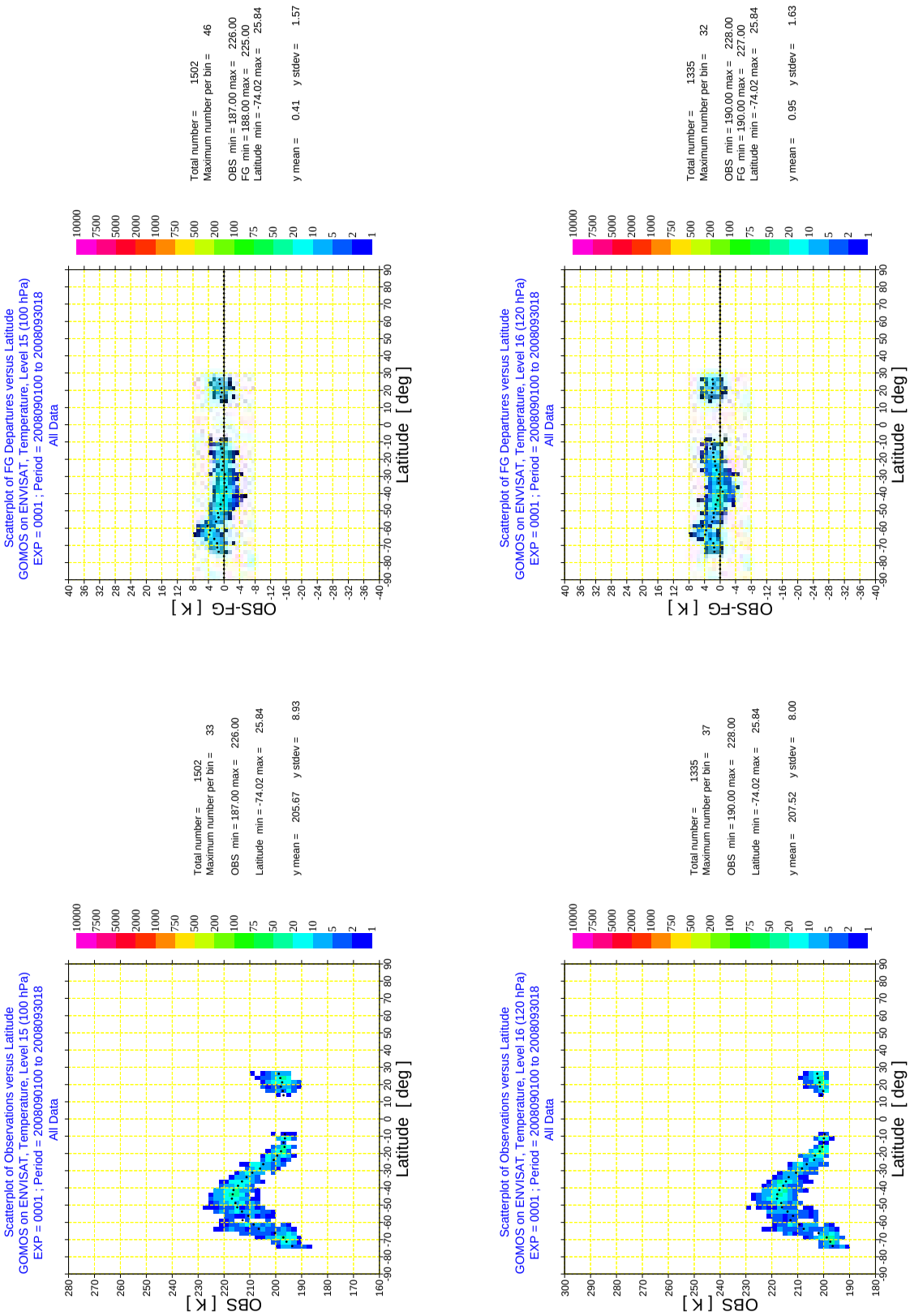


Fig. 14. As Fig. 7 but for level 15 (100 hPa) and level 16 (120 hPa).

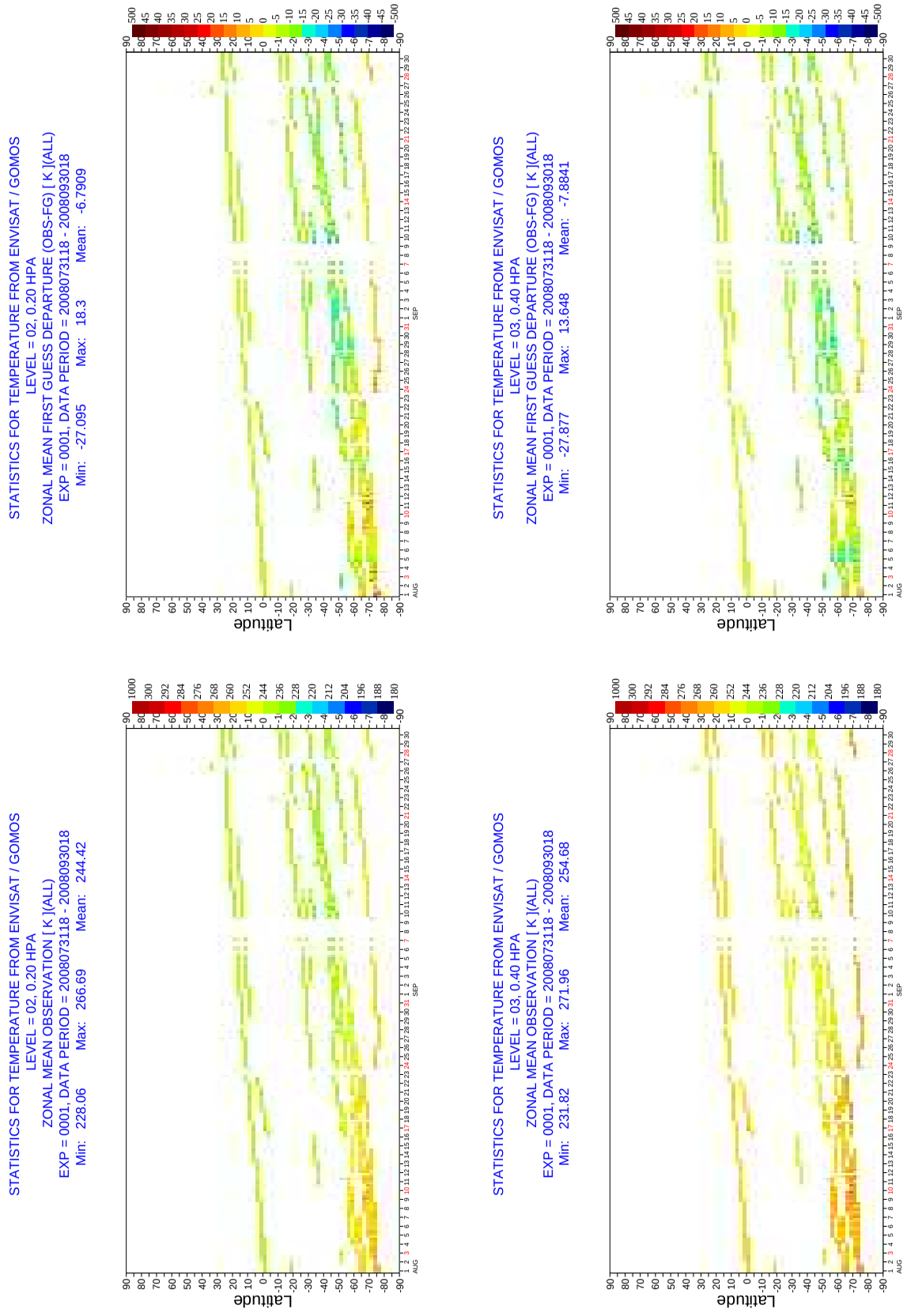


Fig. 15. Hovmoeller diagram of zonal mean ENVISAT GOMOS NRT temperature data per 6-hour cycle and of the zonal mean first-guess departures for level 2 (0.2 hPa) and level 3 (0.4 hPa) for August-September 2008.

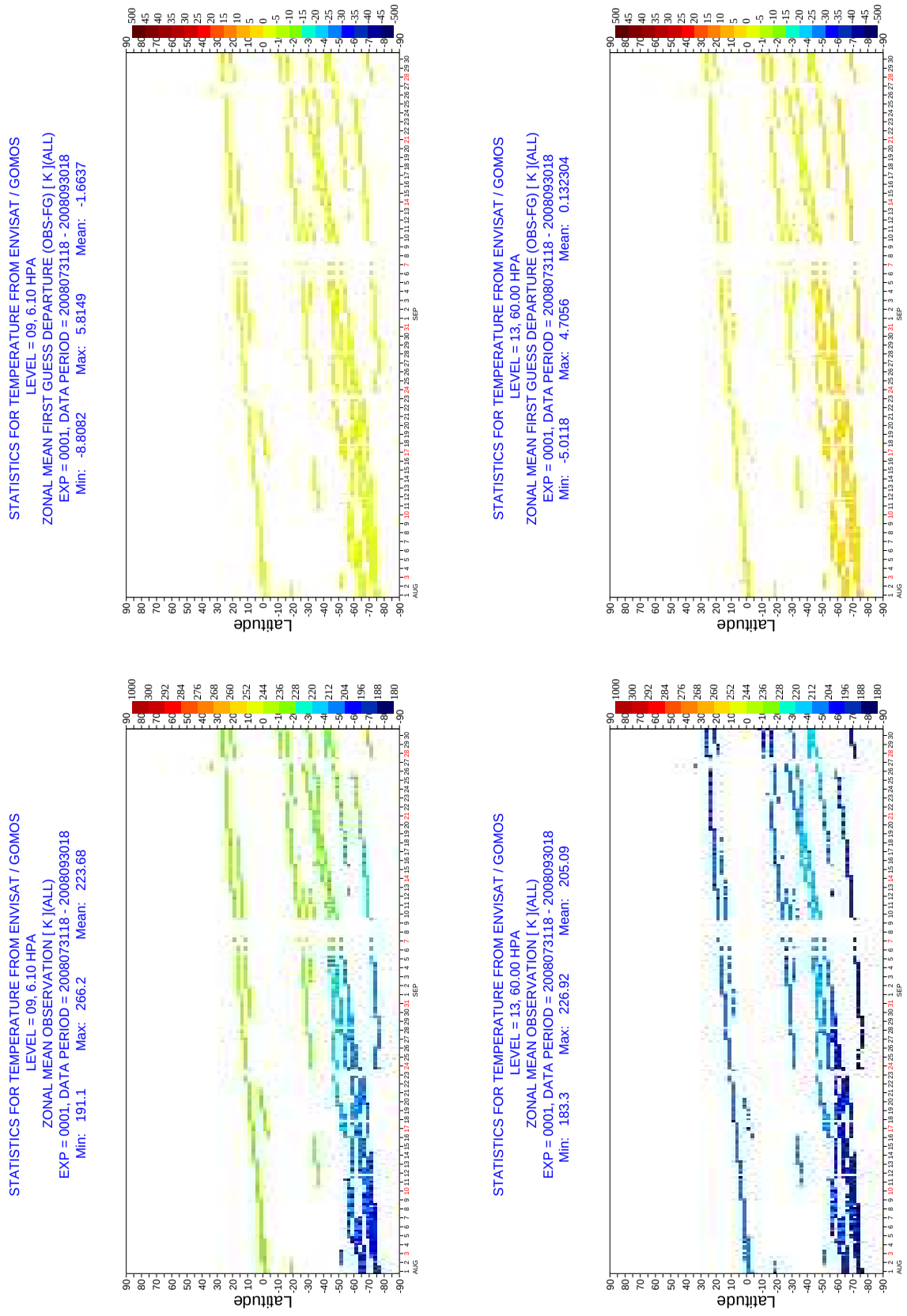


Fig. 16. As Fig. 15 but for level 9 (6.1 hPa) and level 13 (60 hPa).

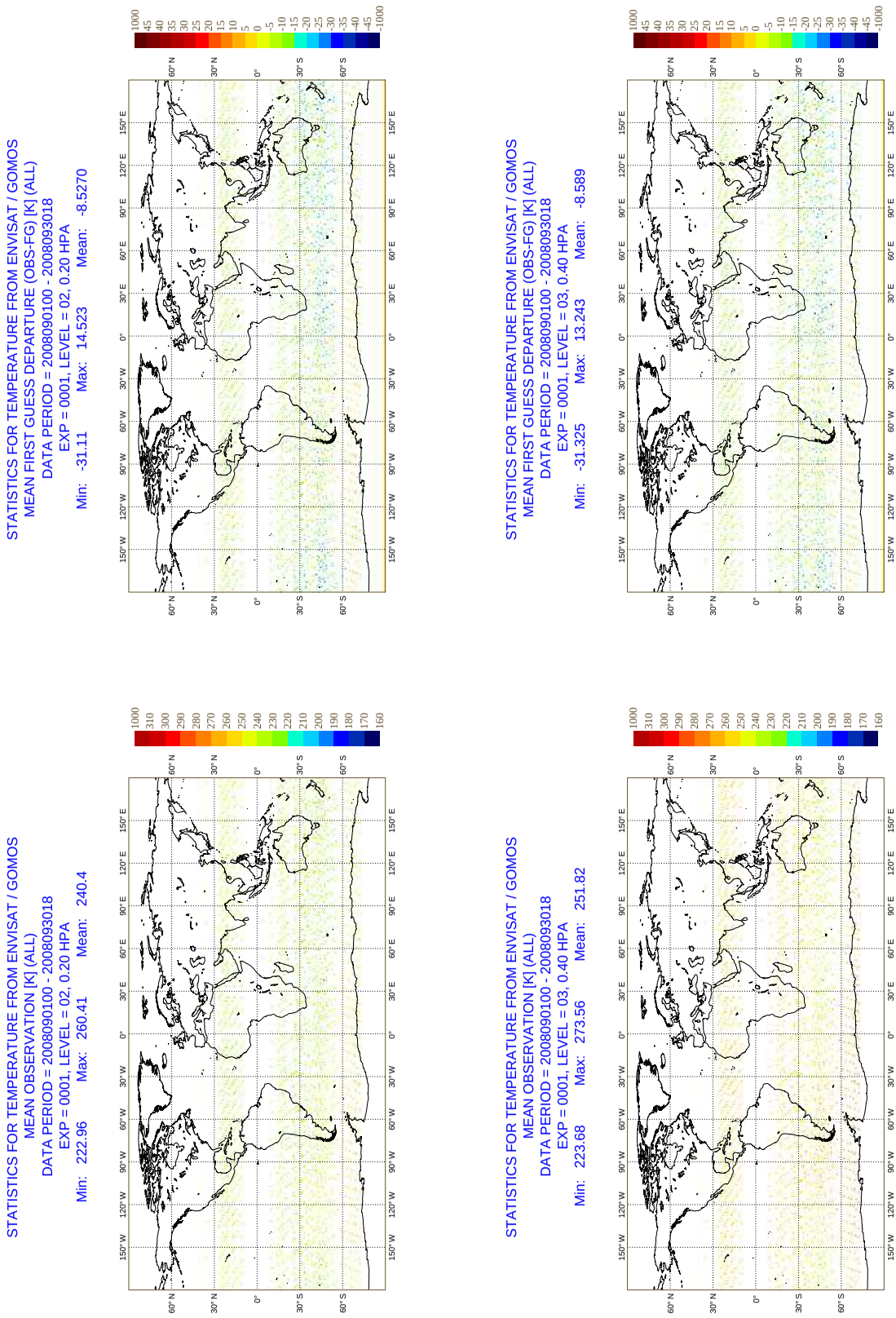


Fig. 17. Geographical distribution of mean ENVISAT GOMOS NRT temperature data and mean first-guess departures for level 2 (0.2 hPa) and level 3 (0.4 hPa) for September 2008.

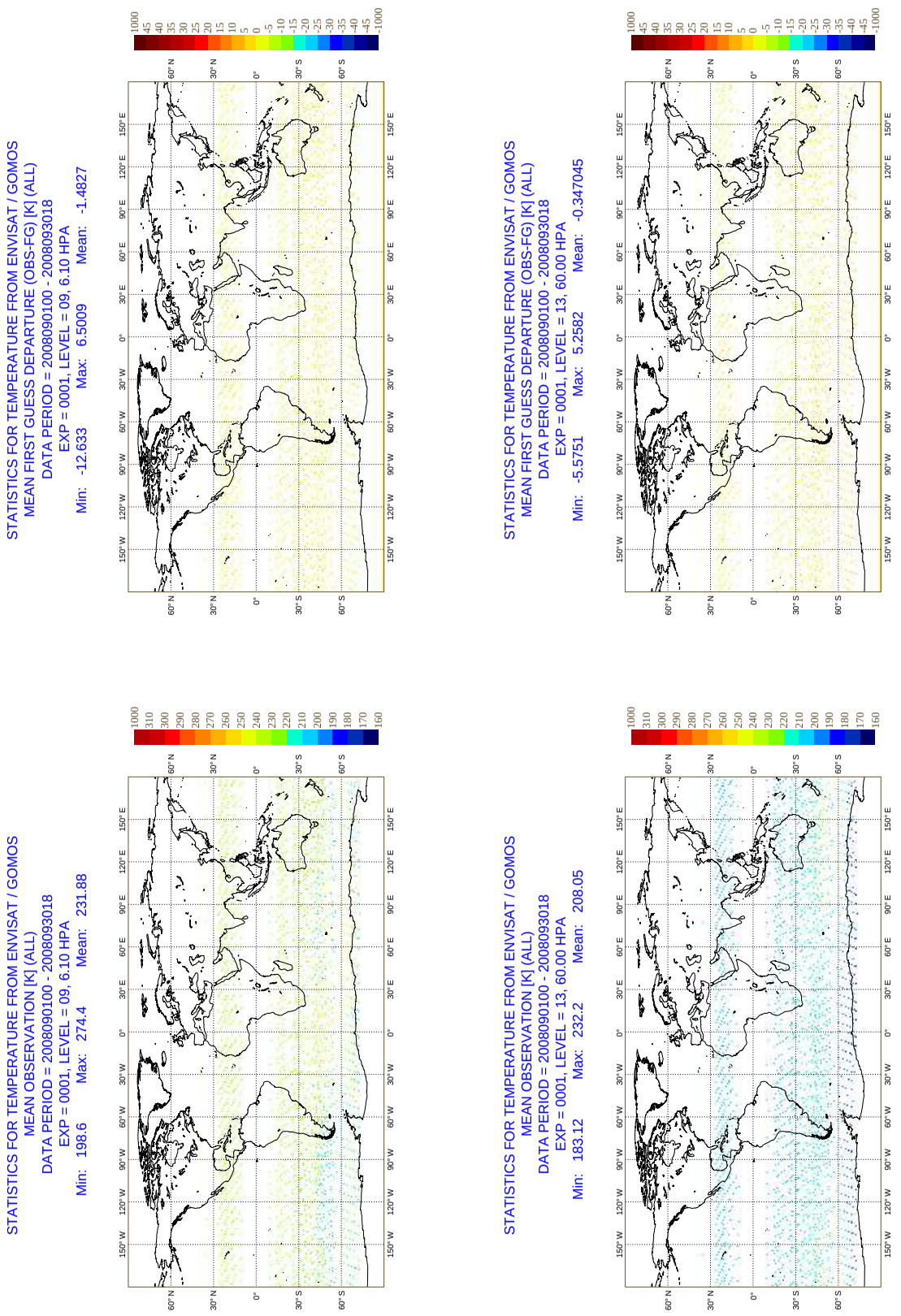


Fig. 18. As Fig. 17 but for level 9 (6.1 hPa) and level 13 (60 hPa).

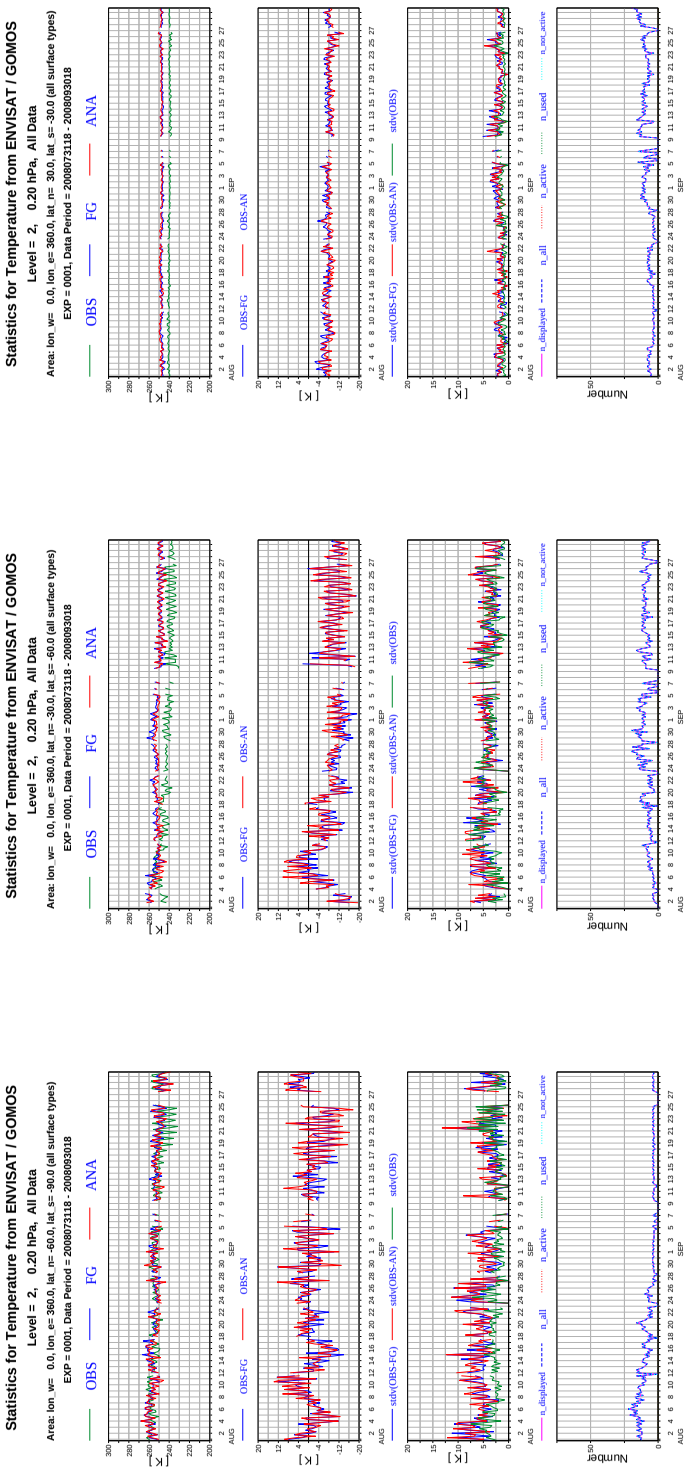


Fig. 19. Timeseries of mean ENVISAT GOMOS NRT temperature data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for level 2 (0.2 hPa) 30N-30S, 30-60S, and 60-90S for the period August-September 2008.

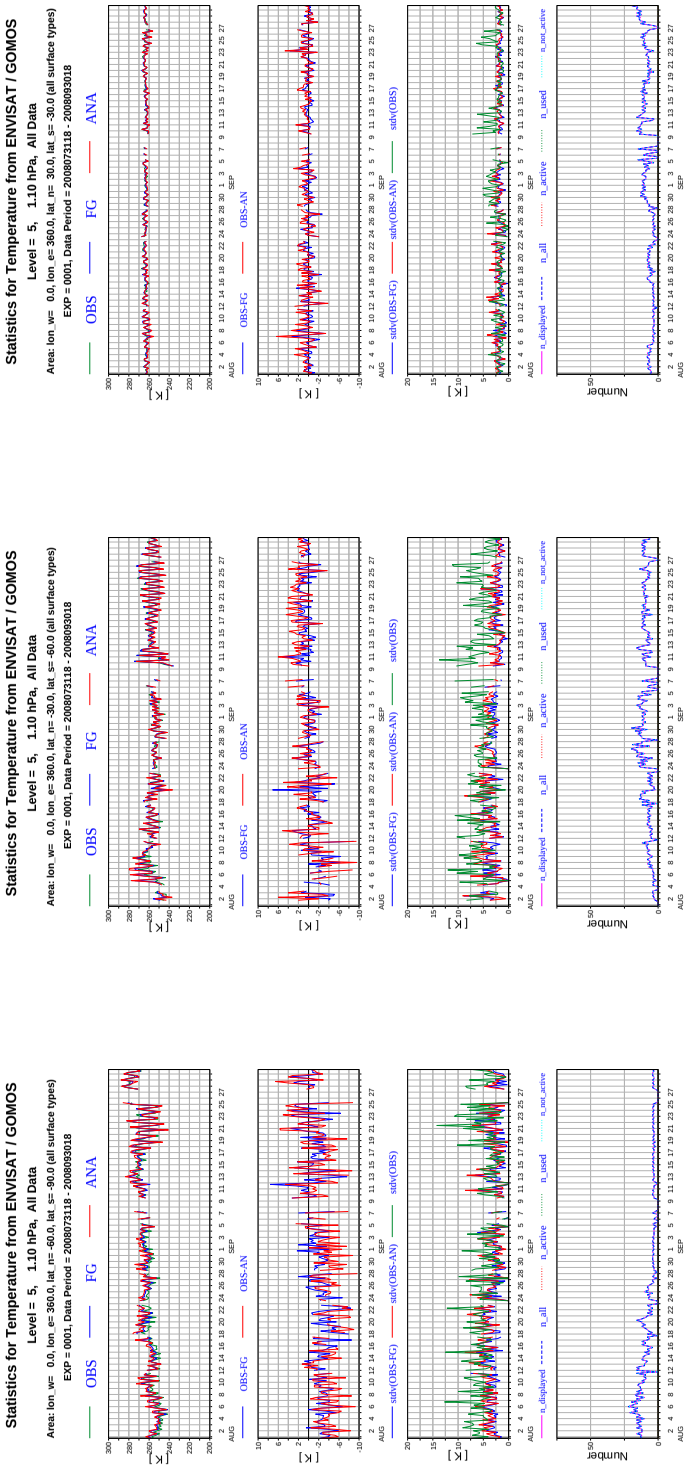


Fig. 20. As Figure 19, but for level 5 (1.1 hPa).

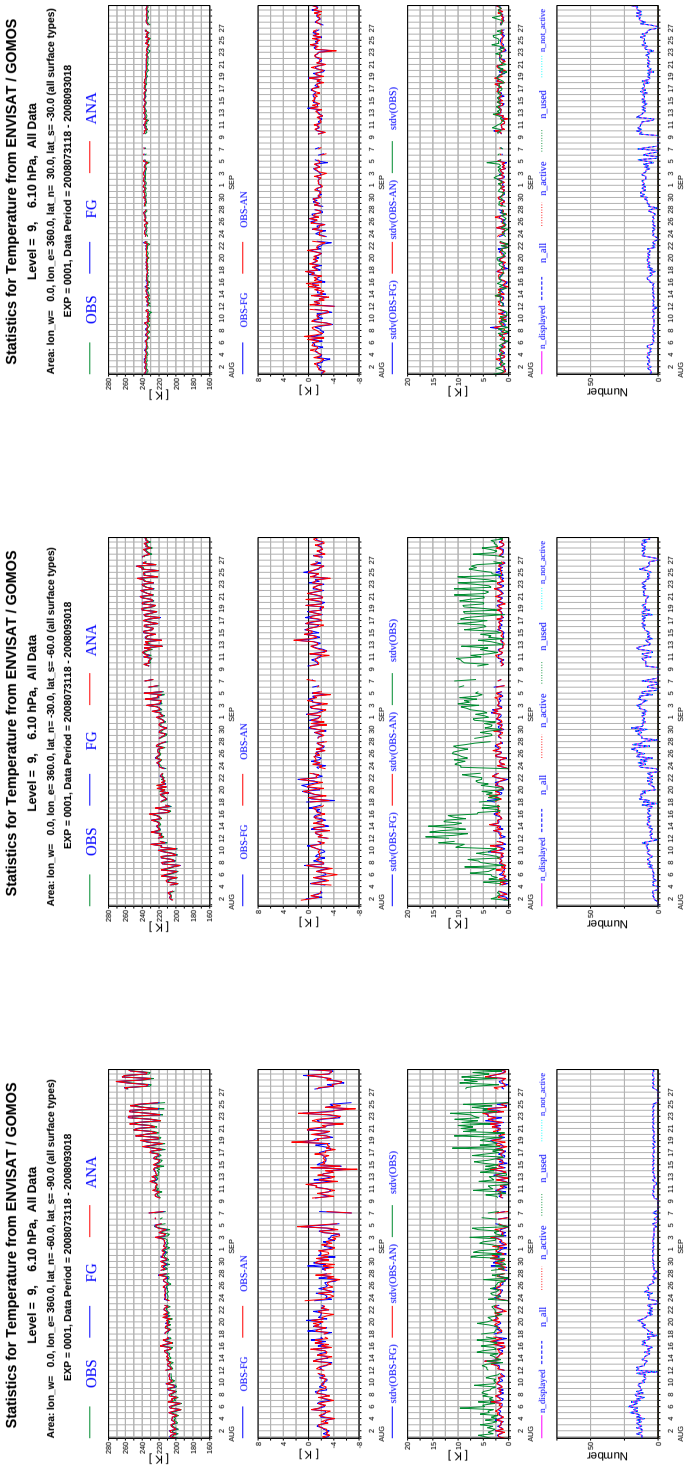


Fig. 21. As Figure 19, but for level 9 (6.1 hPa).

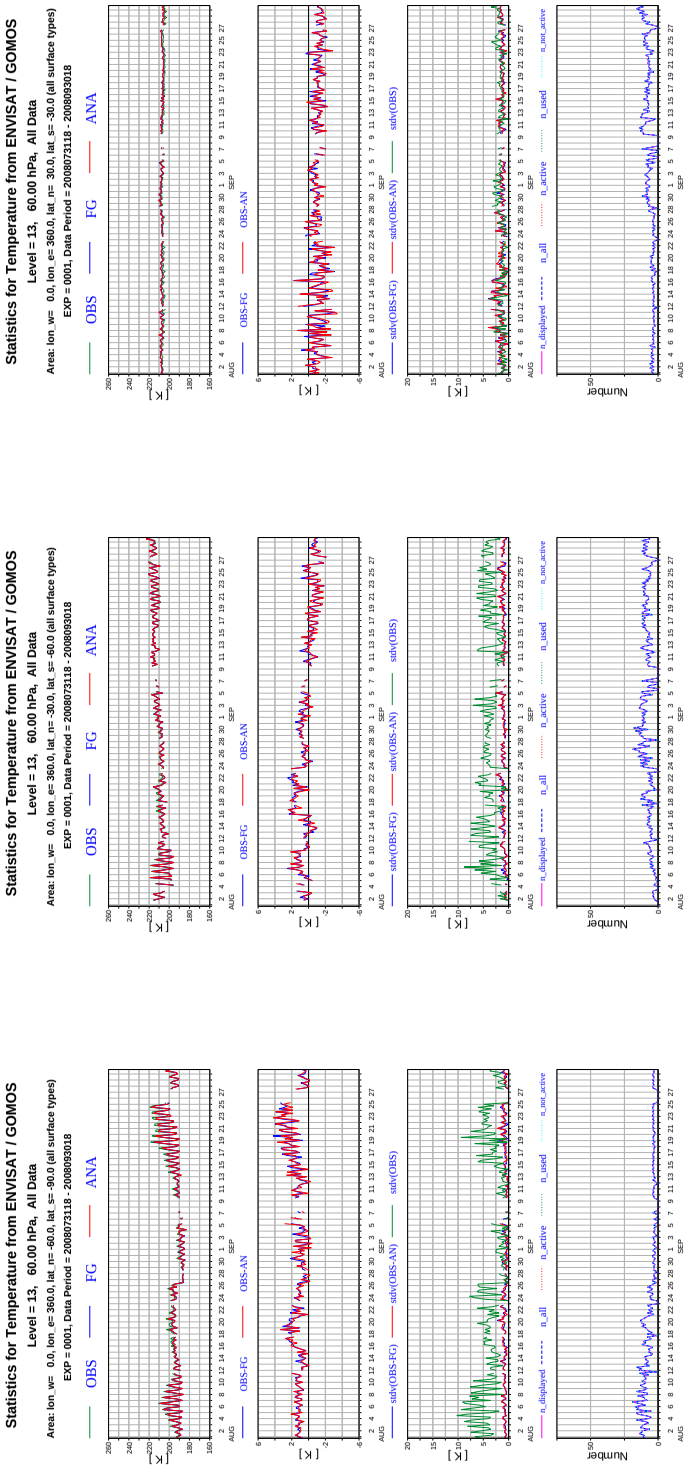


Fig. 22. As Figure 19, but for level 13 (60 hPa).