

REPORT ABOUT ENVISAT GOMOS NRT PRODUCTS (GOM_RR_2P) FOR JUNE 2007

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July 6, 2007

1. Key points for June 2007

- No data were found in BUFR format in the Northern Hemisphere as the observations did not fulfil the dark limb illumination condition set in the new PDS2BUFR converter (see report for May 2007).
- The quality of NRT GOMOS data was generally found improved during June 2007 at least in the global mean.
- Good agreement was found between GOMOS and ECMWF temperatures. NRT GOMOS temperatures were lower than ECMWF temperatures at all levels in the stratosphere and mesosphere at least in the global mean.
- The global mean departures between GOMOS temperatures and ECMWF temperature analyses were less than -0.5% (about -1K) in all the stratosphere, up to 1hPa. Negative departures down to -2% (about -4K) were found, on global average, in the mesosphere.
- The departures between GOMOS and ECMWF ozone profiles were within -5 and +25% in the global mean, that is a slightly larger range than that found in May. However, the standard deviations of the first guess and analysis departures were strongly reduced from being larger than 50% at all levels and latitudinal bands to a minimum value of 20% in the global mean in most of the Stratosphere.
- When averaging over latitudinal bands, the level of agreement between GOMOS ozone observations and the ECMWF ozone fields found in the global mean statistics was generally confirmed.
- 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 profile plots showed that the GOMOS water vapour values were still from one to three order of magnitude larger than those given by the model at all vertical levels and latitudinal bands. Outliers were also found at all vertical levels at most latitudes in the SH.
- The monitoring statistics for June 2007 were produced with the operational ECMWF model, CY32R2.

2. Quality and amount of received data

Data coverage and amount of received data during June 2007 are shown in figures 1 and 2 in the temperature, ozone and water vapour reports. Overall, less than 1500 (good) observations were available for temperature and just above 1300 for ozone, with the largest number of observations available in the mesosphere and upper stratosphere, and only a fraction of them were available in the lower stratosphere (see figure 3 in the

attached temperature and ozone reports). For what concerning the water vapour, just about 630 observations were available in the period under consideration, with the largest number in the stratosphere (see figure 3 in the attached water vapour report). No data were found in the BUFR files in the NH for the period under consideration, as they did not fulfil the selection criterion of the dark illumination condition set in the PDS2BUFR converter.

3. GOMOS temperature data

The quality of GOMOS NRT data was generally found improved during June 2007, at least in the global mean, and in better agreement with the ECMWF first-guess and analyses, as expected after the poor quality data were filtered out in the BUFR files.

The global mean profile plot (temperature report: Figure 3) showed that the mean GOMOS temperature is still colder than that from the ECMWF temperature first guess and analyses over most of the stratosphere and mesosphere, with departures that now are less than -0.5% (-1 K) in the lower Stratosphere (up to 15 hPa), and just below -1% (about -2 K) in the upper Stratosphere. The agreement between the ECMWF temperature and the GOMOS temperature is also improved in the global mean at mesospheric levels, where the departures are no larger than -2% (about -4 K), as opposite to the -3% (between -5 and -6 K) found in May. When averaging over latitudinal bands, almost -1% difference can still be found in the tropical Stratosphere, and -2% in the tropical Mesosphere. At midlatitudes in the SH, the GOMOS and ECMWF temperature are within $\pm 0.5\%$ (± 1 K) in the Stratosphere, but up to -8% in the Mesosphere. Between 60S and 90S, the first guess and analyses departures are within -1% and +0.5% in the Stratosphere up to 10 hPa, and -1% from 10 up to 0.4 hPa. The standard deviations of the first guess and analysis departures are larger than 1% at all vertical levels and latitudinal bands.

The scatter plots (temperature report: Figures 7-14) showed a similar level of agreement between GOMOS observations and the ECMWF temperature as shown in the May report (SH only), with a variability of the first-guess departures within ± 4 K at most vertical levels in the Stratosphere. As already noted above, larger departures were seen in the Mesosphere with differences of ± 24 K between single measurements and their model equivalent.

The Hovmoeller plots and the timeseries of GOMOS temperatures and departures at several levels are shown in Figures 15, 16, 19-22 of the temperature report, respectively. Both the Hovmoeller plots and the timeseries confirmed that the quality of the data was in a reasonably good agreement with the ECMWF analyzed ozone fields (first-guess departures being typically within ± 2 K) at least in the Stratosphere. Larger departures were found in the Mesosphere, especially at high latitudes.

4. GOMOS ozone data

Some indications of improvements in the quality of GOMOS NRT ozone were seen at Stratospheric levels in June compared with that reported in the last few months, but mainly limited to the standard deviations.

The profile plots (ozone report: Figures 3-6) showed that in the global average, the first-guess departures were within -5 and +25% in most of the stratosphere and lower mesosphere, as opposite to the -2 and +15% range variability found in May. Although the departures seem larger, the standard deviations of the first guess and analysis departures were strongly reduced from being larger than 50% at most vertical levels to about 20% in most of the Stratosphere. Larger standard deviations were found in the Mesosphere.

When averaged over latitudinal bands, the level of agreement between GOMOS ozone observations and the ECMWF ozone fields found in the global mean was generally confirmed. In the tropics, the GOMOS observations exhibit higher ozone values at most vertical levels, with departures from the ECMWF first guess

and analyses up to 25% in the Stratosphere and Mesosphere. The standard deviations of the analysis and first guess departures were reduced in this area as well, with minimum values of about 10% in the upper Stratosphere. At midlatitudes, the departures were typically within -15 and +15% at most vertical levels in the Stratosphere; larger departures were found elsewhere. The standard deviation of the departures was reduced to about 15% between 3 and 40 hPa, but larger values were seen at other vertical levels. At high latitudes, the departures between observations and model ozone were typically within -25% and +30% in the Stratosphere and lower Mesosphere. The standard deviations of the first guess and analysis departures were reduced, with minimum values of about 10% in the Stratosphere between 40 and 10 hPa.

The scatter plots (ozone report: Figures 7-14) showed more clearly the improvements in the level of agreement between the GOMOS ozone and the ECMWF ozone, especially in the Stratosphere, where the variability of the observations was much reduced and as a consequence of that the number of outliers was also strongly reduced compared with the statistics produced in the last few months.

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

Despite the filter applied in the PDS2BUFR converter to keep only the data acquired in dark-limb conditions, the level of agreement between the GOMOS water vapour and the ECMWF water vapour first guess and analyses was still found poor.

The profile plots (Water Vapour report: Figures 3-4) showed that the GOMOS water vapour values were from one to three order of magnitude larger than those given by the model at all vertical levels and latitudinal bands.

The scatter plots (water vapour report: Figures 5-10) also showed large scatter in the GOMOS water vapour data at all vertical levels and at all latitudes, and as a consequence large scatter in the first guess departures. Outliers were also found at all vertical levels at most latitudes in the SH.

The Hovmoeller plots and the timeseries of GOMOS water vapour and departures at several levels are presented in Figures 11, and 13-15 of the water vapour report, respectively. Both the timeseries and the Hovmoeller plots show very large differences between NRT GOMOS ozone retrievals and the ECMWF water vapour analyses, consistent with the above analysis.

6. Remarks

This monitoring report was produced with the operational ECMWF model (CY32R2). Ozone layers from SBUV/2 on NOAA-16 and SCIAMACHY total column ozone data produced by KNMI 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/m².

REPORT ABOUT ENVISAT GOMOS NRT TEMPERATURE DATA (GOM_RR_2P) FOR JUNE 2007

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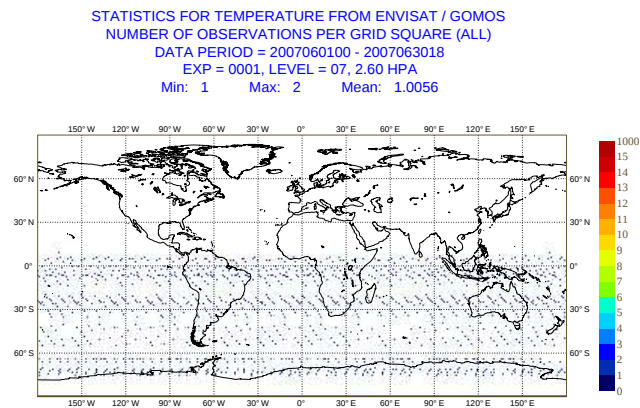


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT temperature data for level 7 (2.6 hPa) for June 2007.

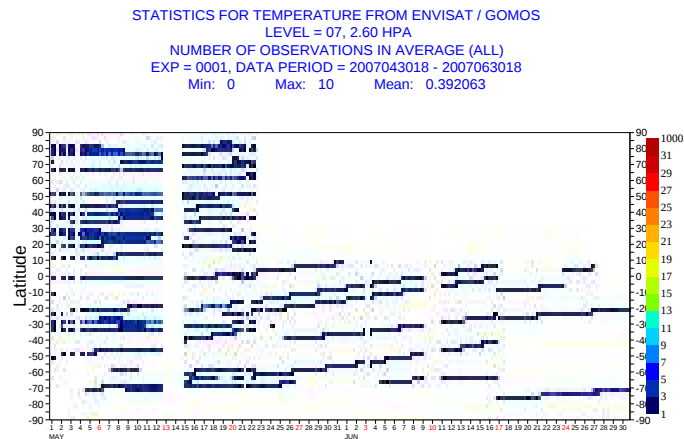


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT temperature data per 6-hour cycle for level 7 (2.6 hPa) for May-June 2007.

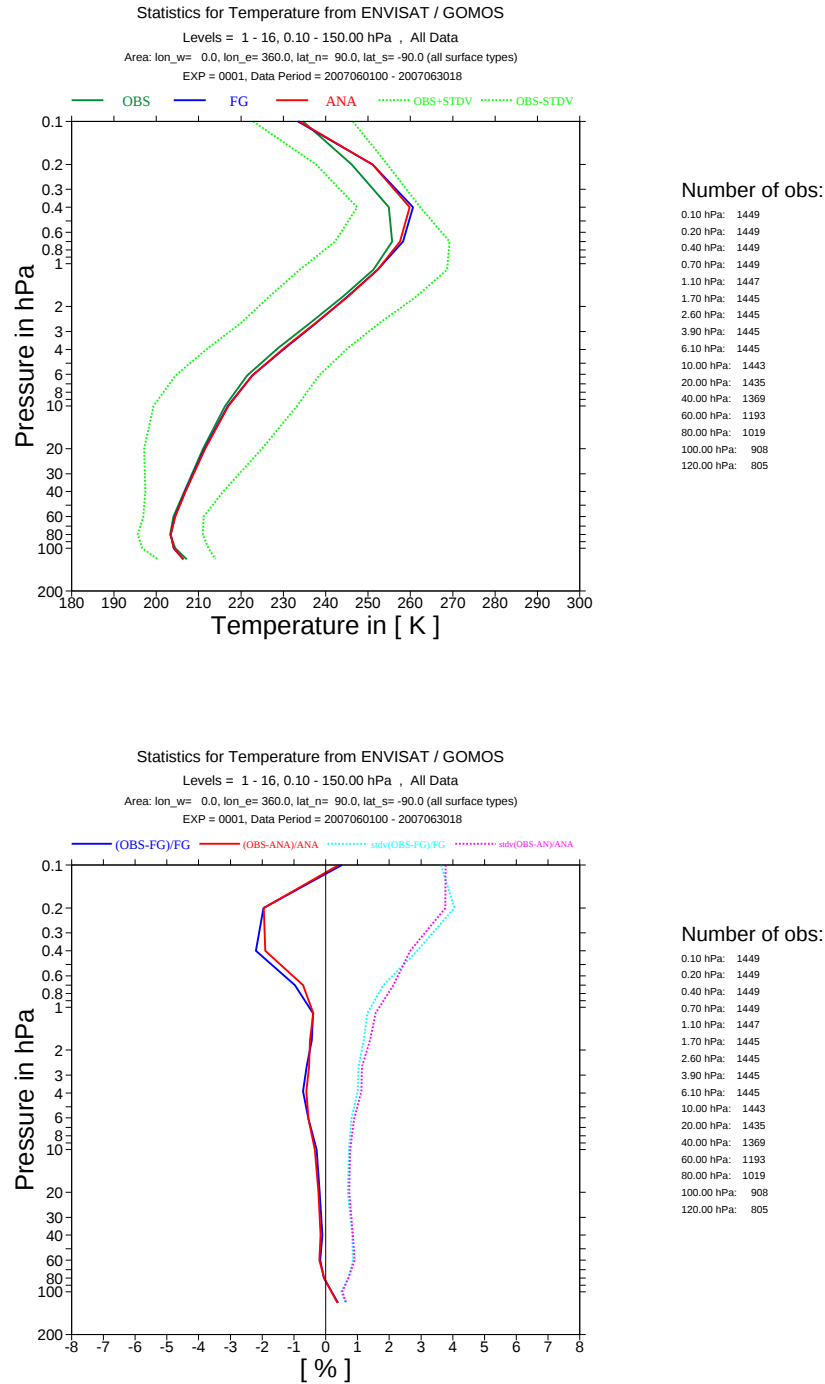


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT temperature data in K for June 2007 (global mean). The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (green), and the mean observation ± 1 standard deviation (green dotted lines). The bottom 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.

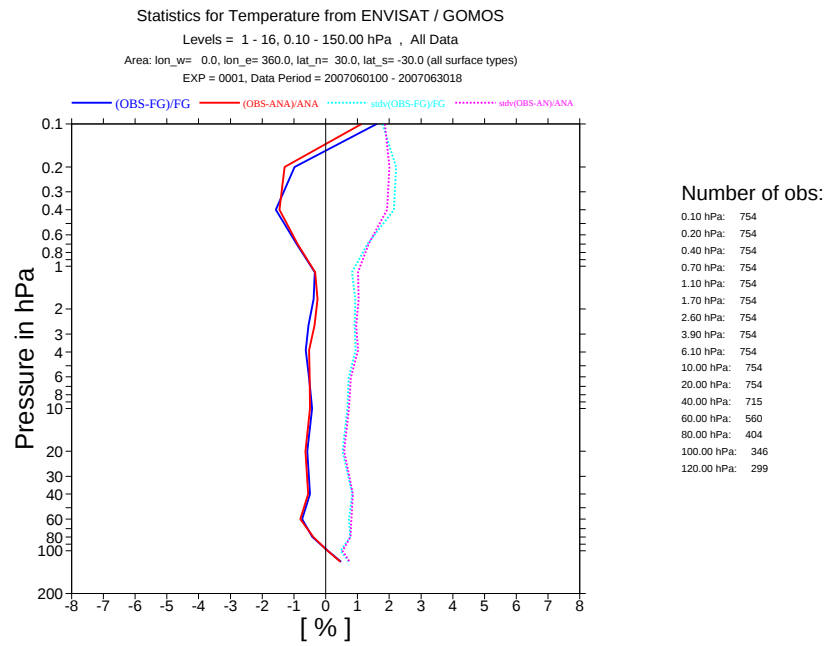
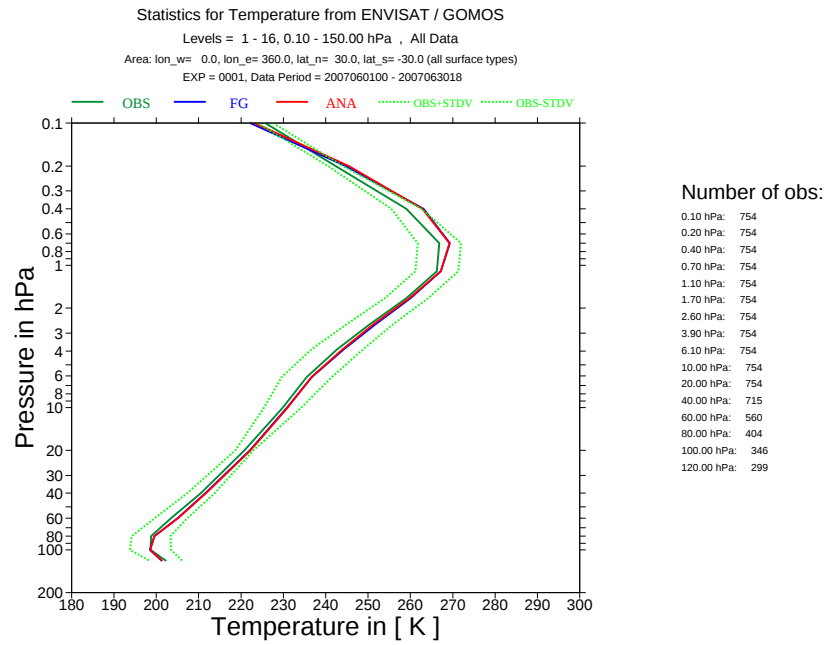


Fig. 4. As Fig. 3 but for 30N-30S.

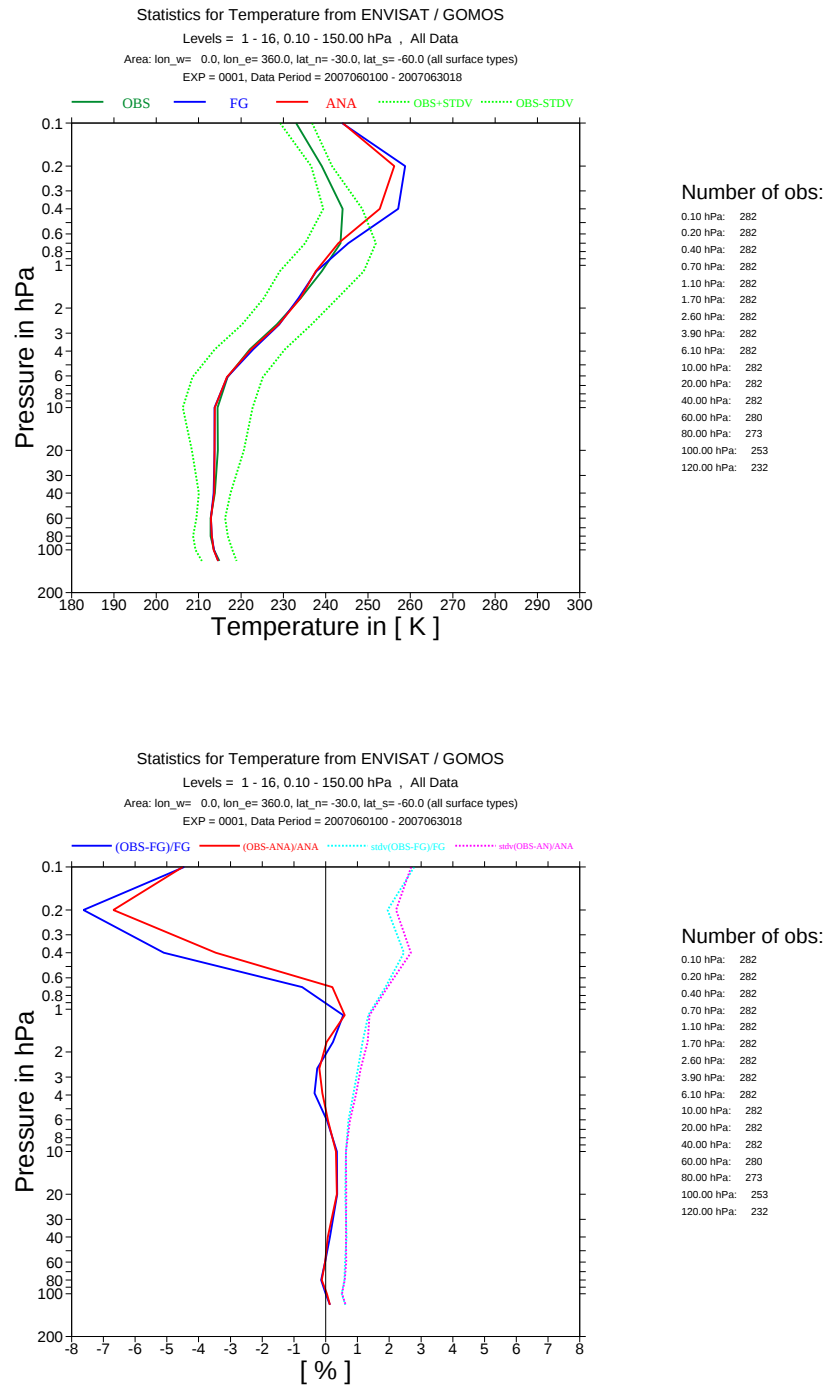


Fig. 5. As Fig. 3 but for 30-60S.

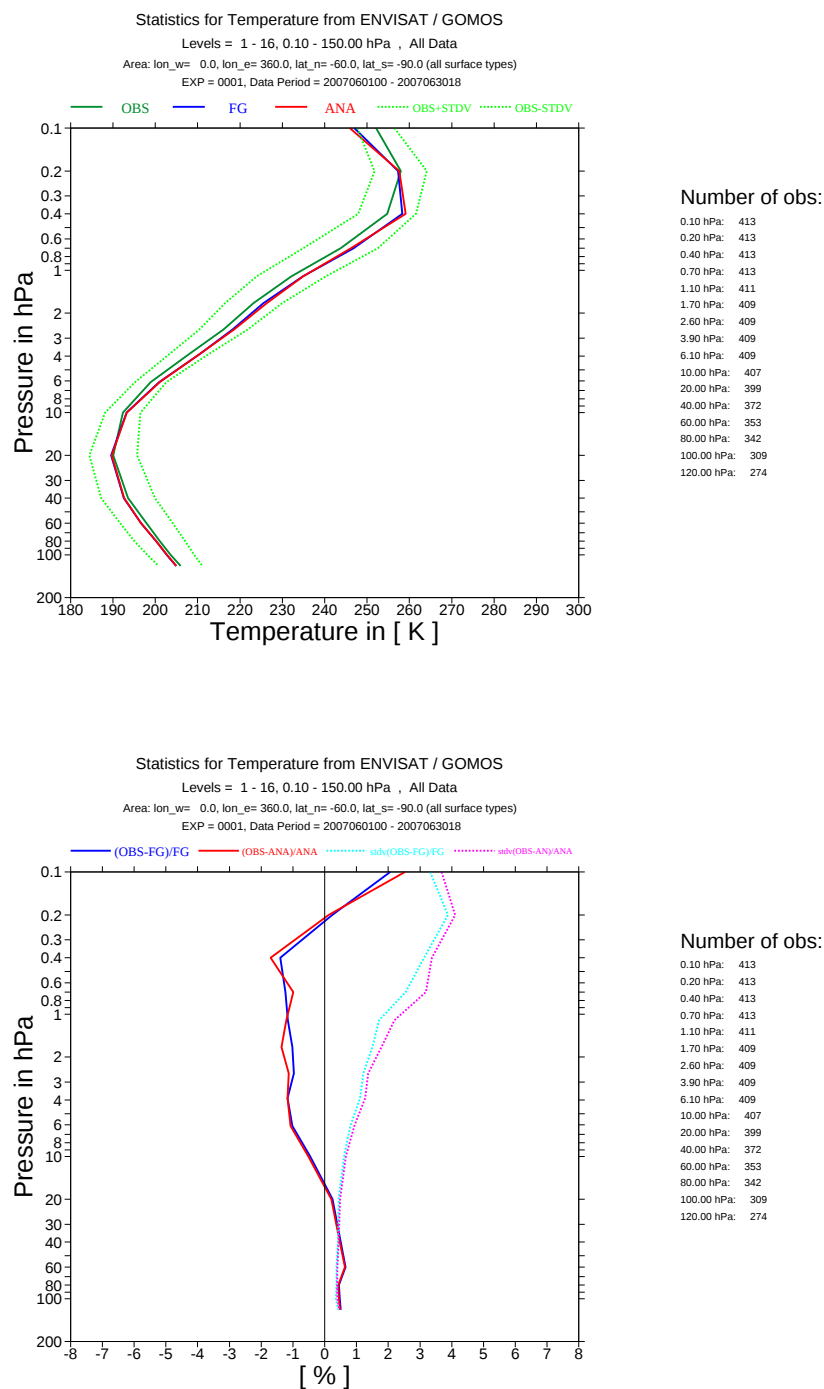


Fig. 6. As Fig. 3 but for 60-90S.

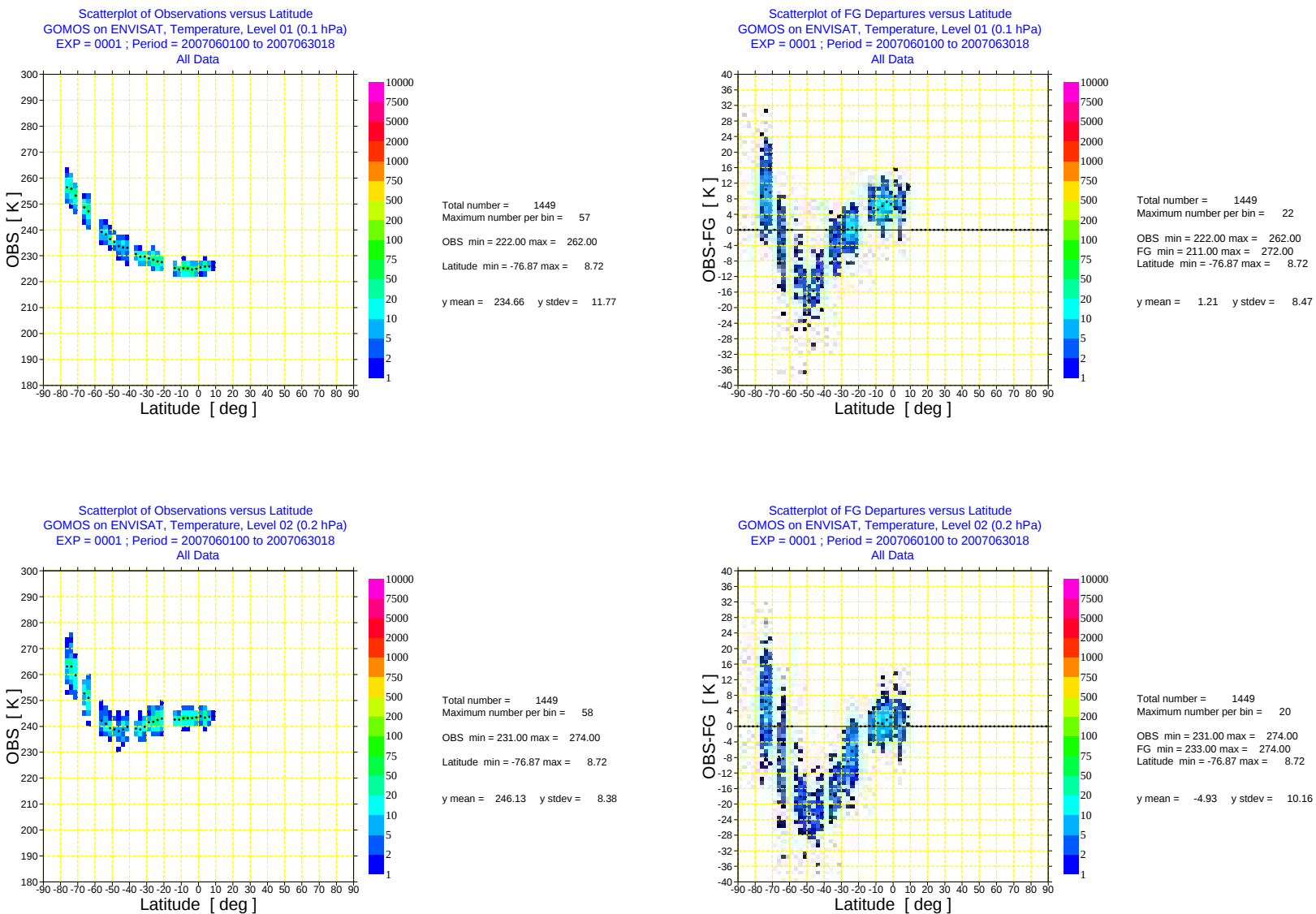


Fig. 7. Scatter plot of ENVISAT GOMOS NRT temperature data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT temperature data against latitude (right) for June 2007 for level 1 (0.1 hPa) and level 2 (0.2 hPa). The colours show the number of data per bin, and the black dots the mean value per bin.

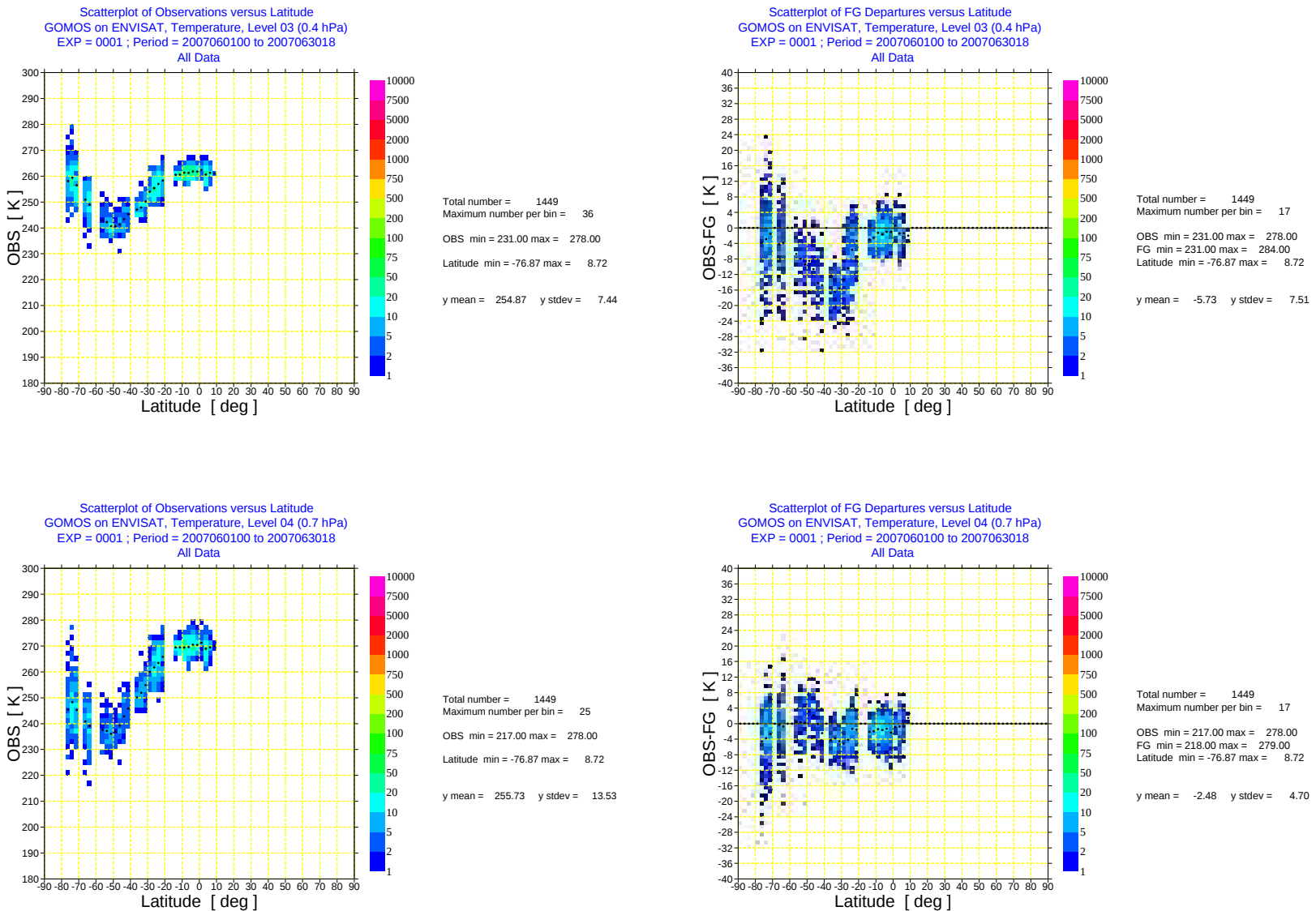


Fig. 8. As Fig. 7 but for level 3 (0.4 hPa) and level 4 (0.7 hPa).

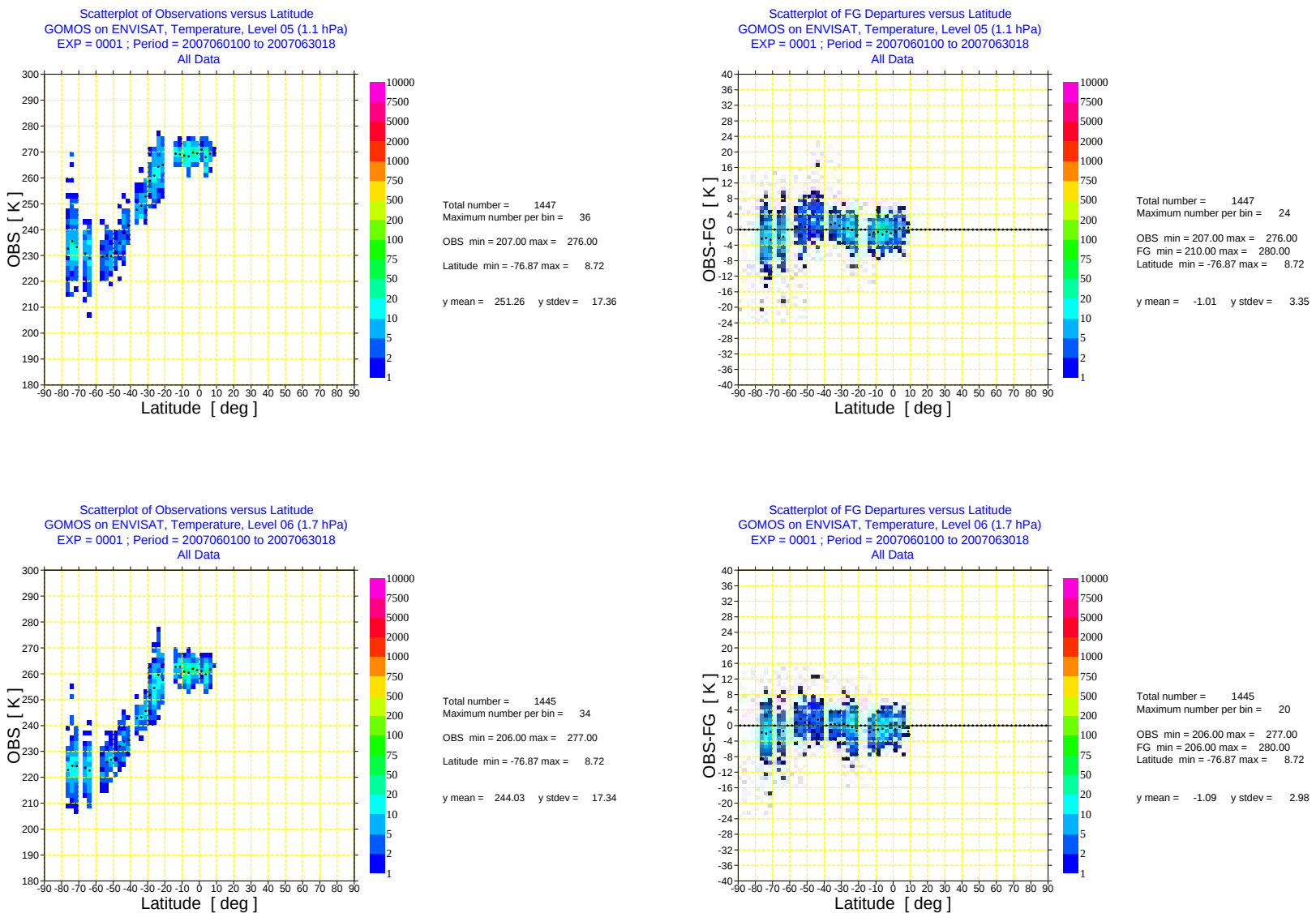


Fig. 9. As Fig. 7 but for level 5 (1.1 hPa) and level 6 (1.7 hPa).

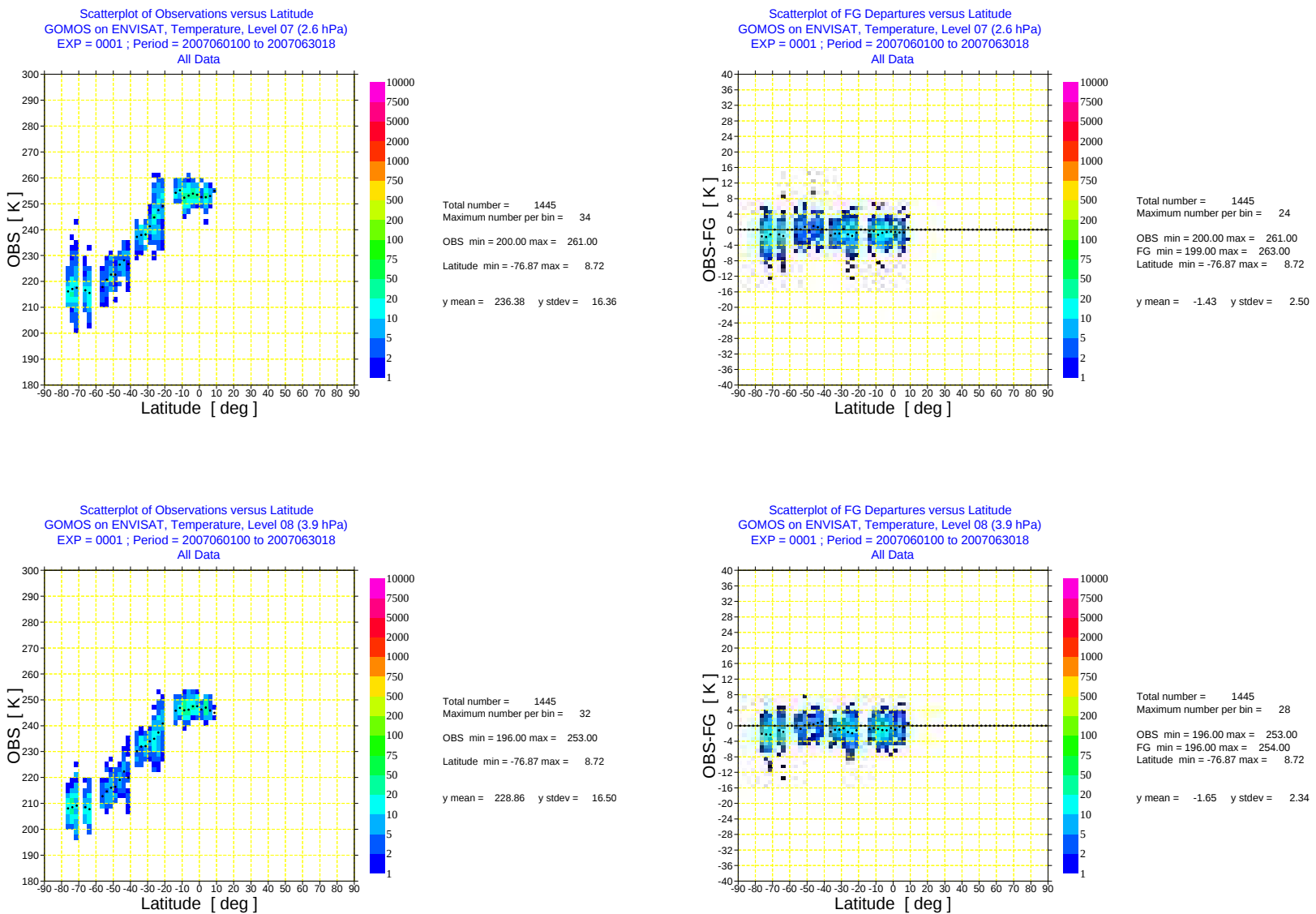


Fig. 10. As Fig. 7 but for level 7 (2.6 hPa) and level 8 (3.9 hPa).

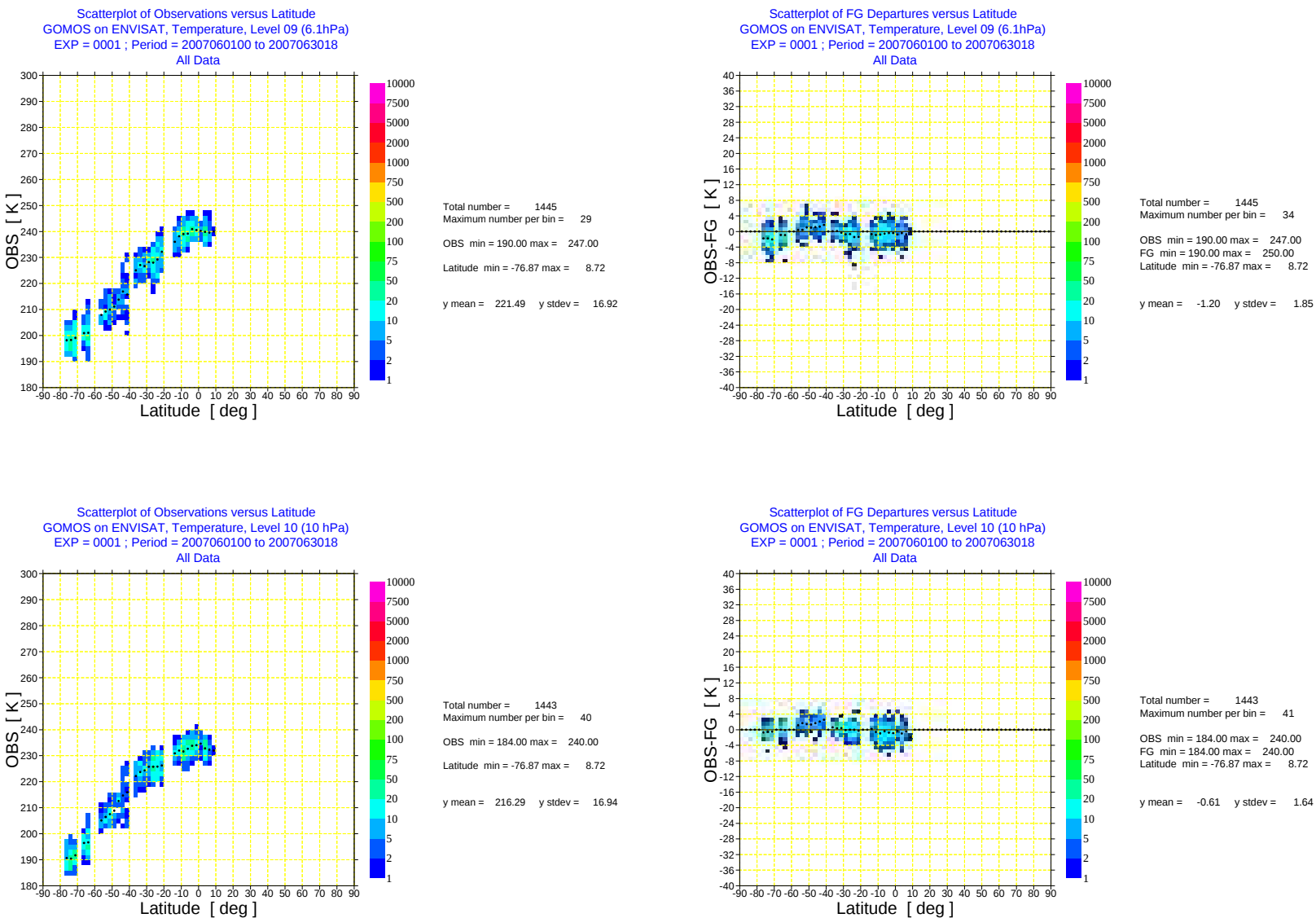


Fig. 11. As Fig. 7 but for level 9 (6.1 hPa) and level 10 (10 hPa).

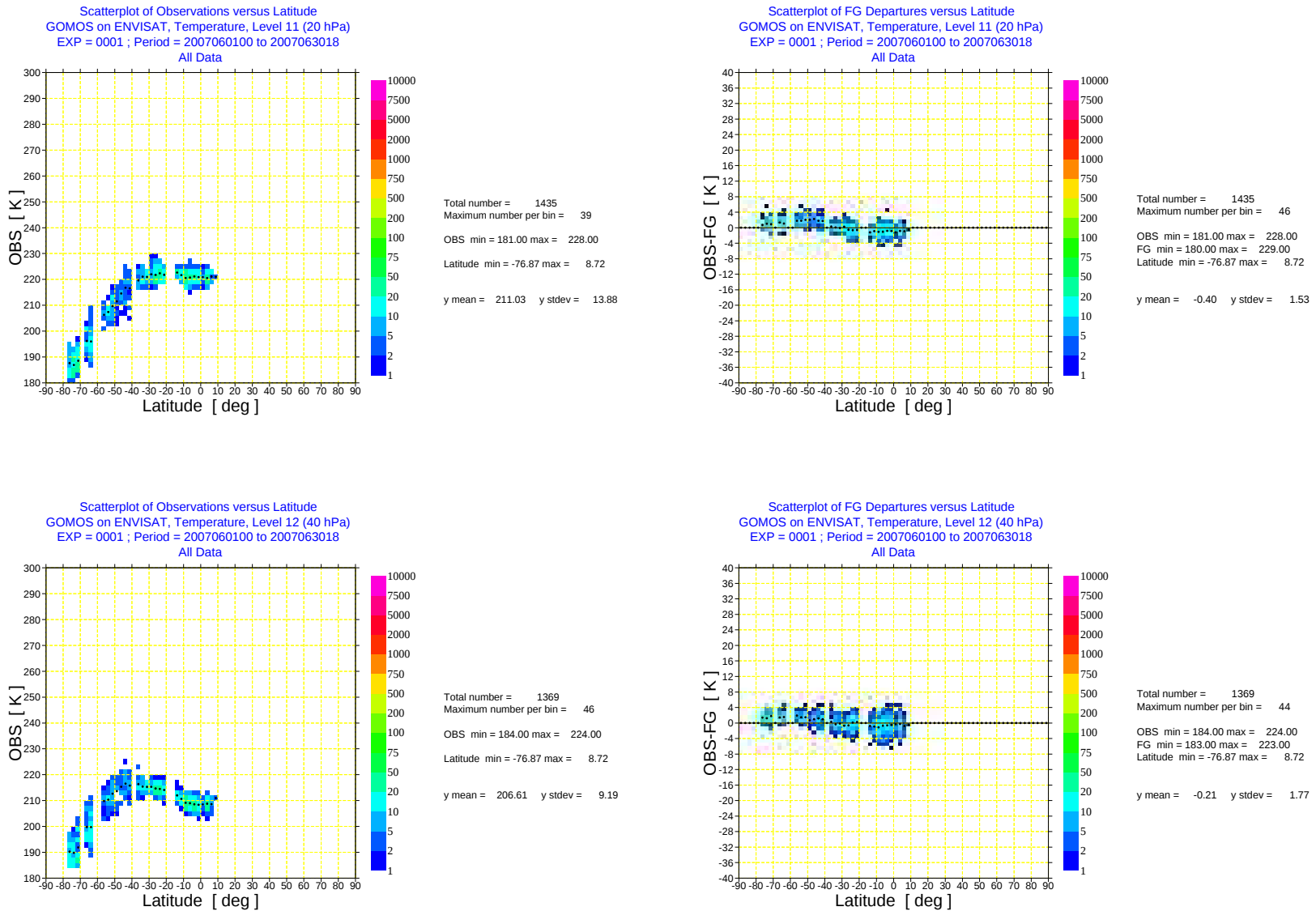


Fig. 12. As Fig. 7 but for level 11 (20 hPa) and level 12 (40 hPa).

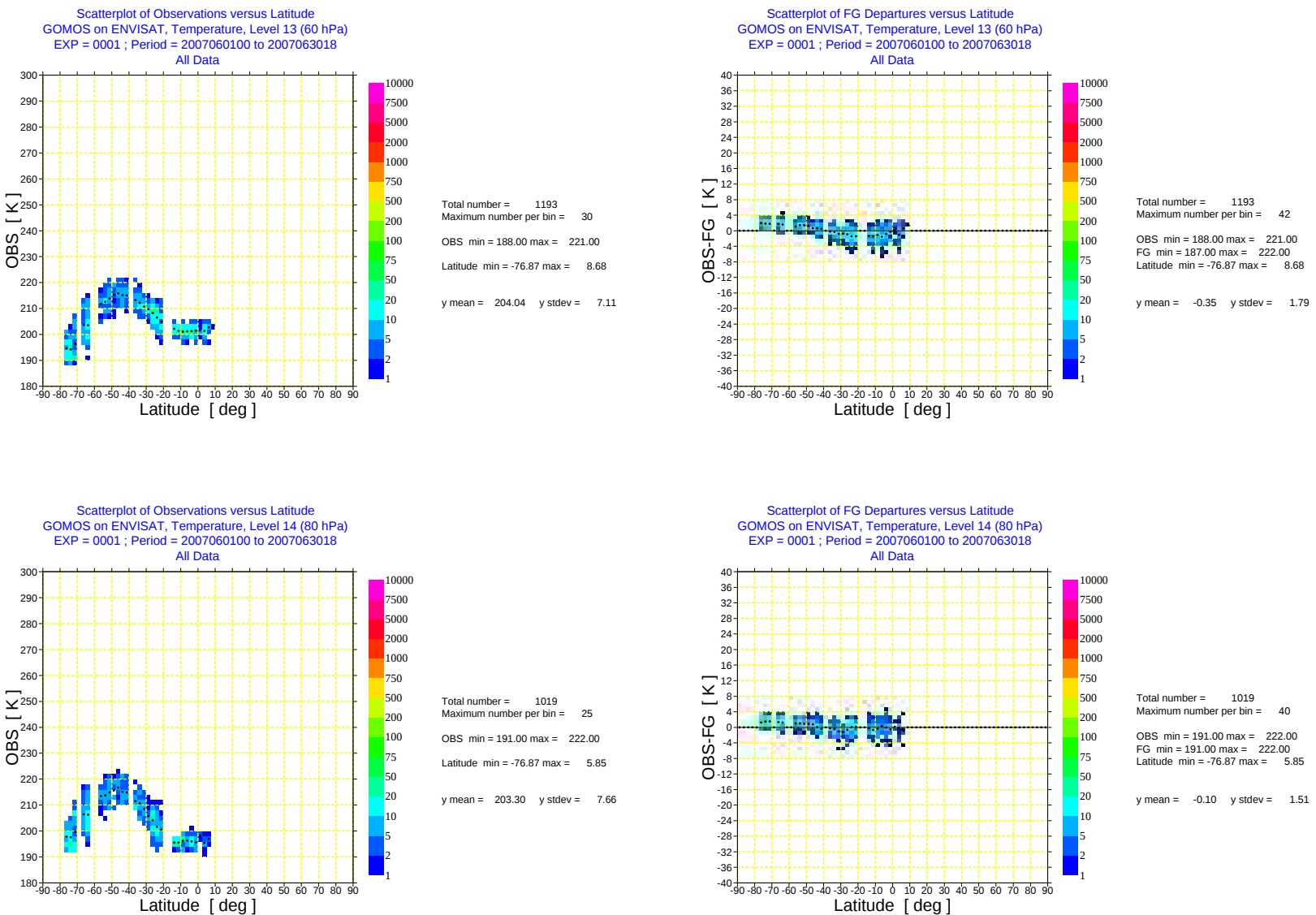


Fig. 13. As Fig. 7 but for level 13 (60 hPa) and level 14 (80 hPa).

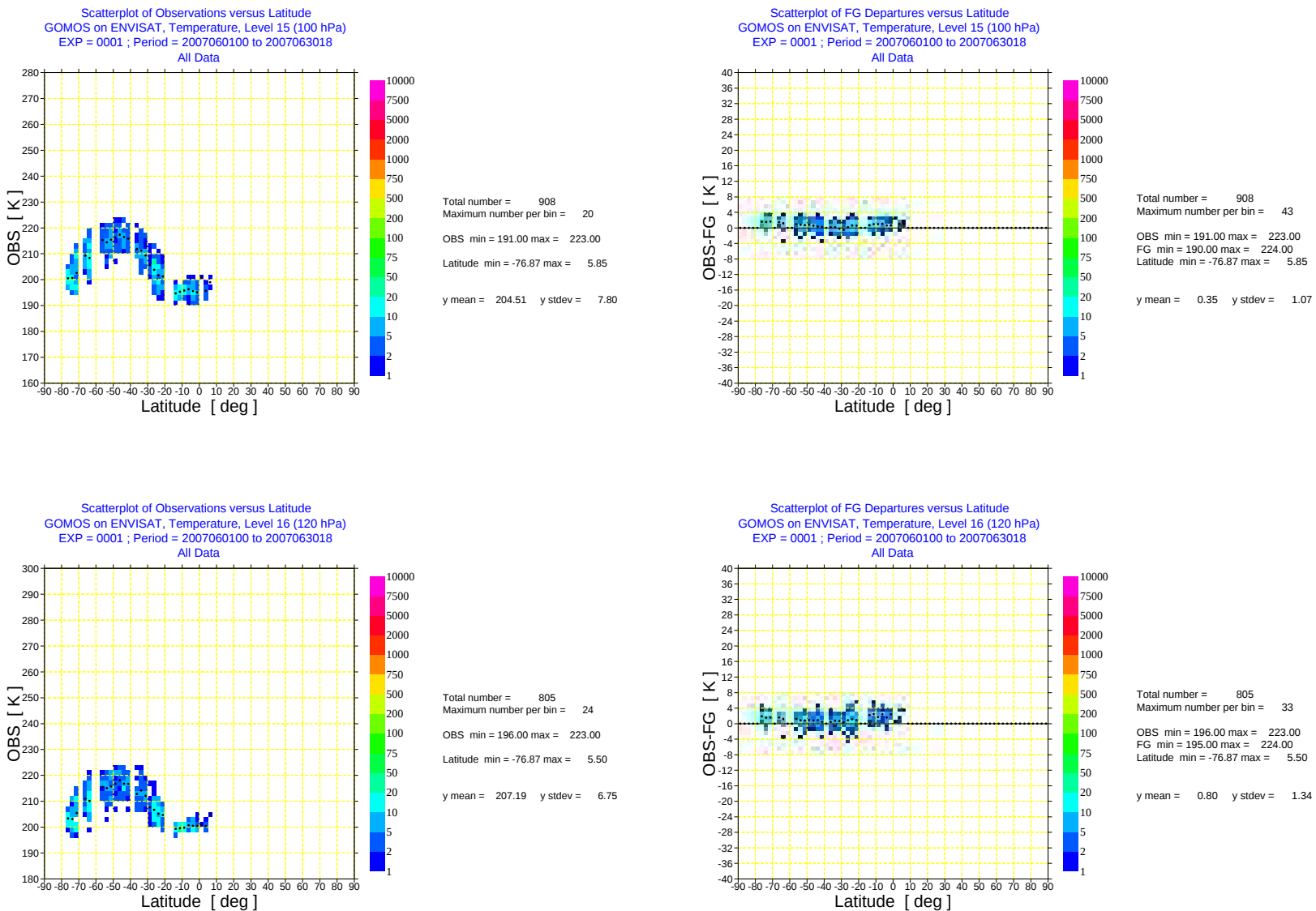


Fig. 14. As Fig. 7 but for level 15 (100 hPa) and level 16 (120 hPa).

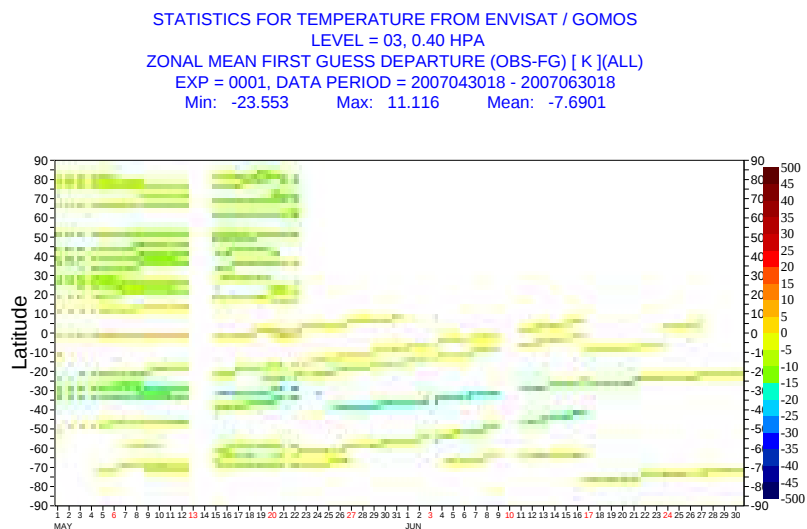
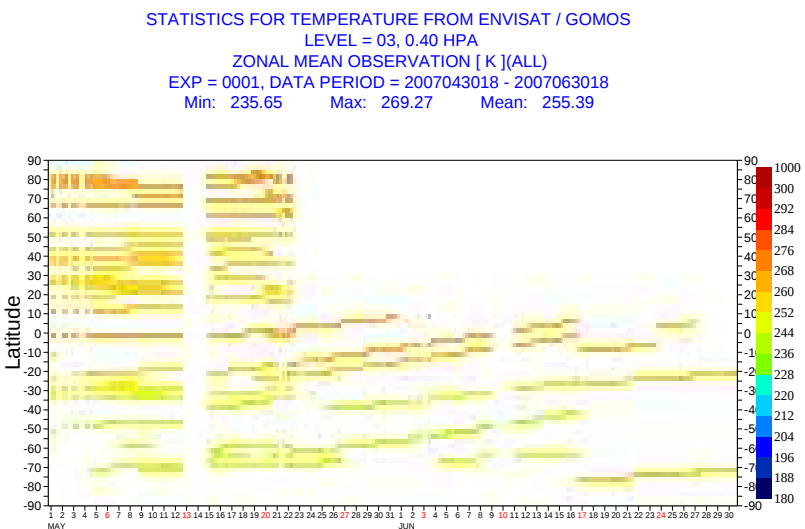
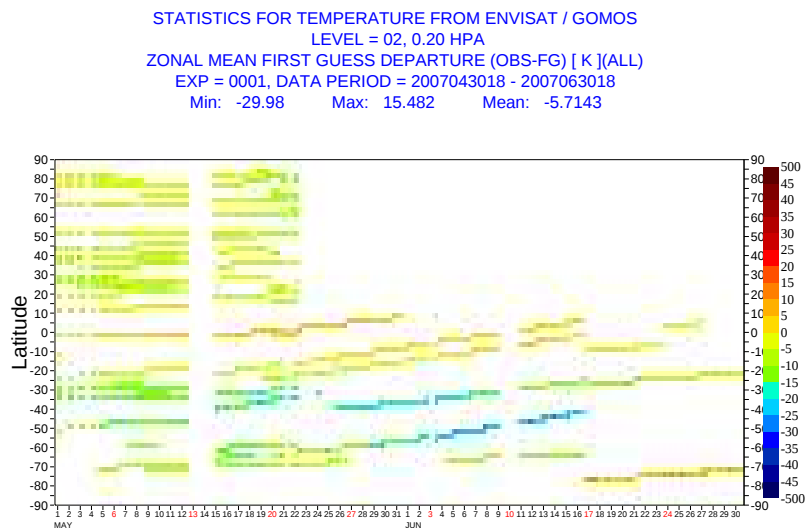
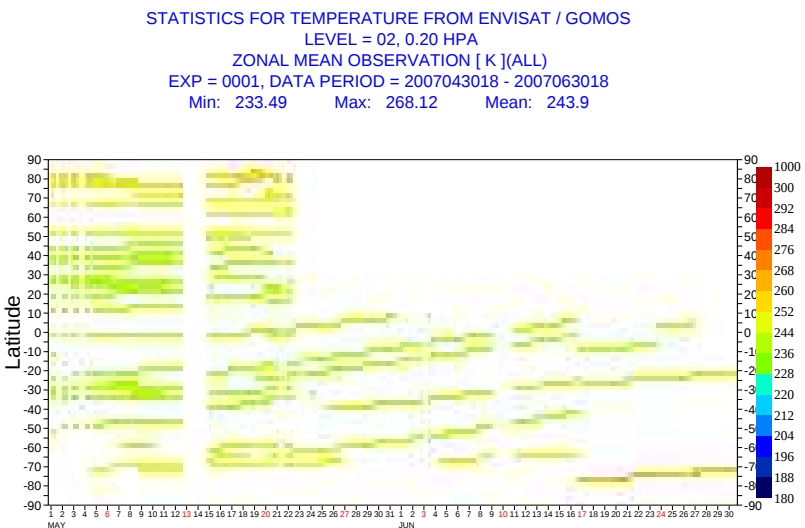


Fig. 15. Hovmöller diagram of zonal mean ENVISAT GOMOS NRT temperature data per 6-hour cycle and of the zonal mean first-guess departures for level 2 (0.2 hPa) and level 3 (0.4 hPa) for May-June 2007.

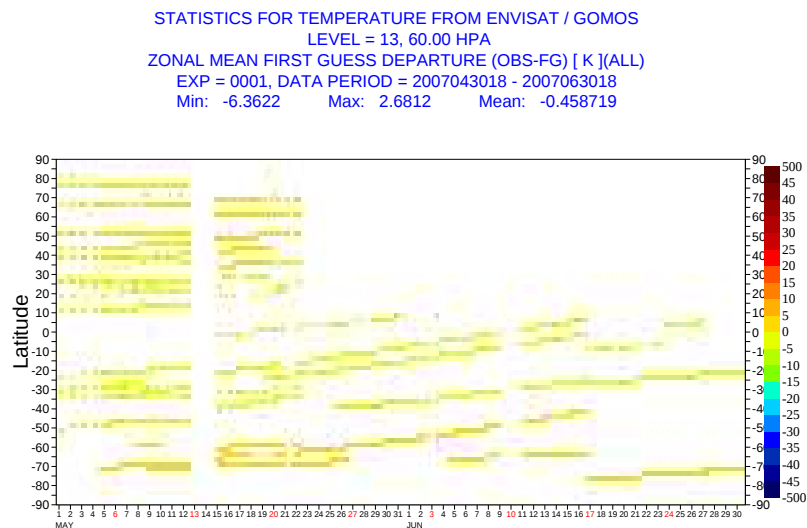
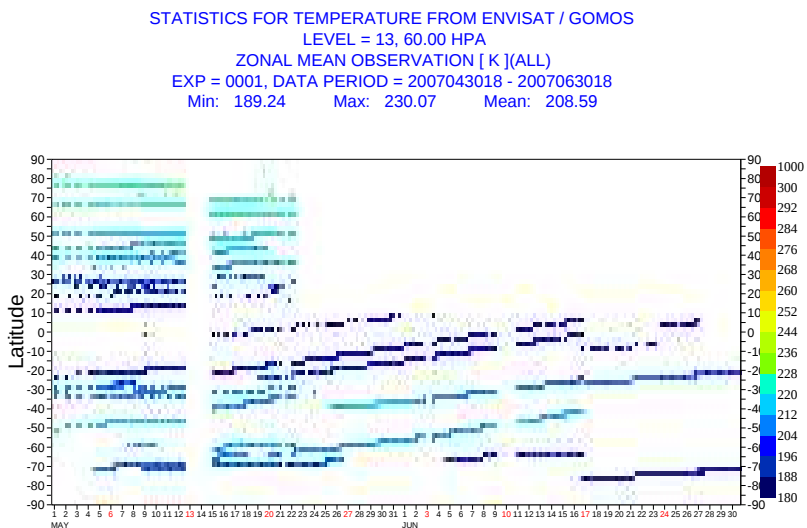
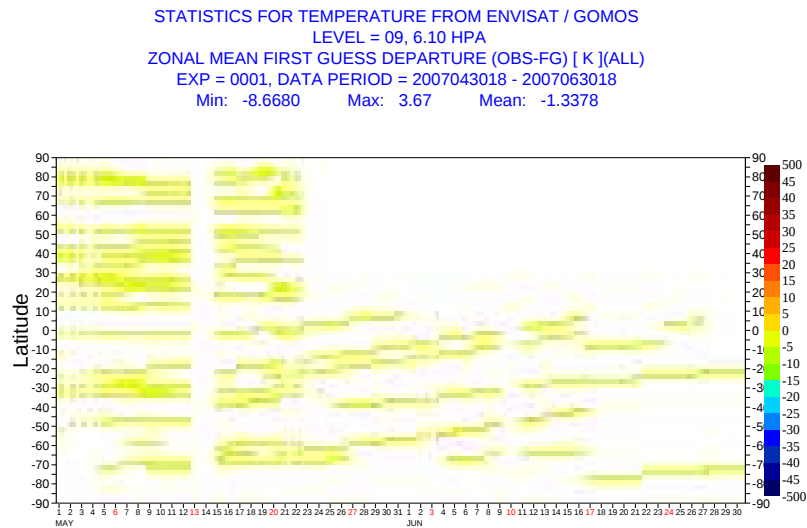
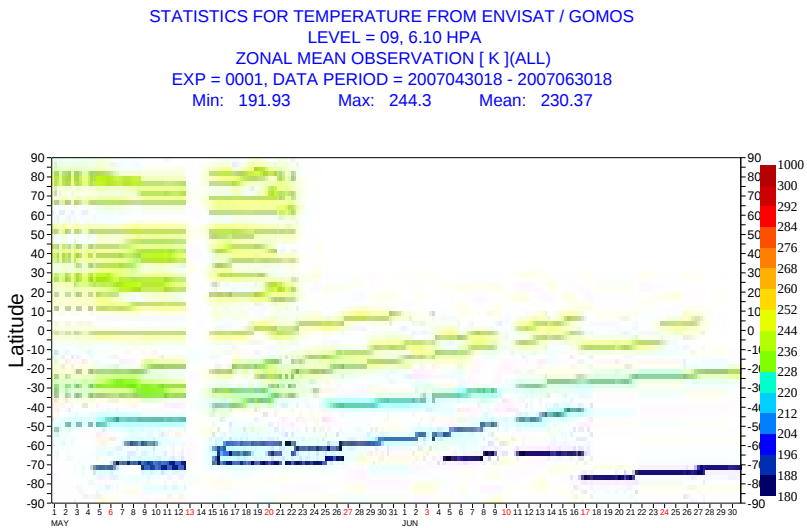
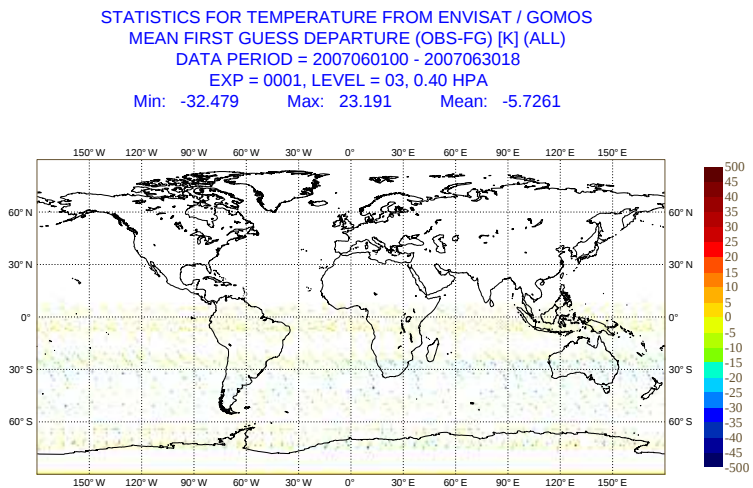
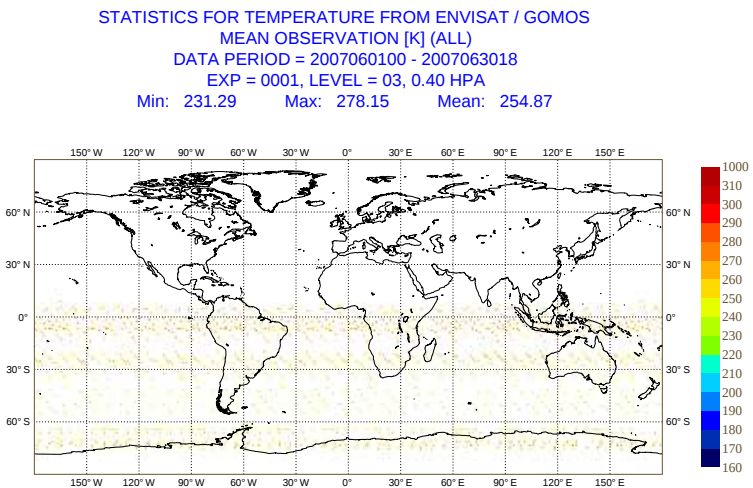
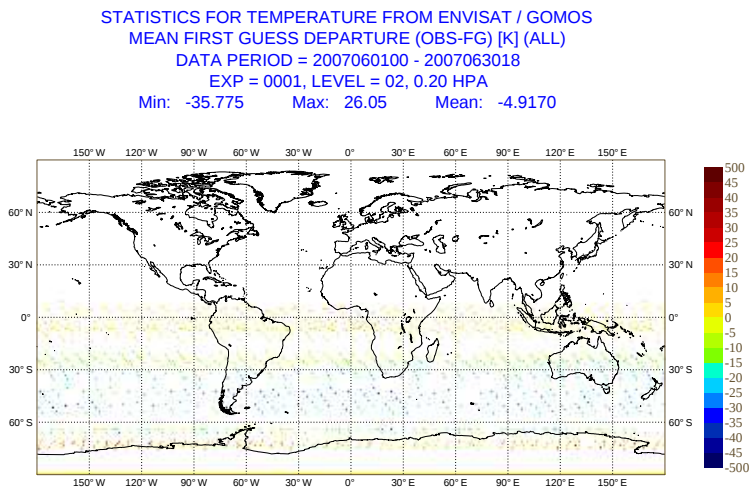
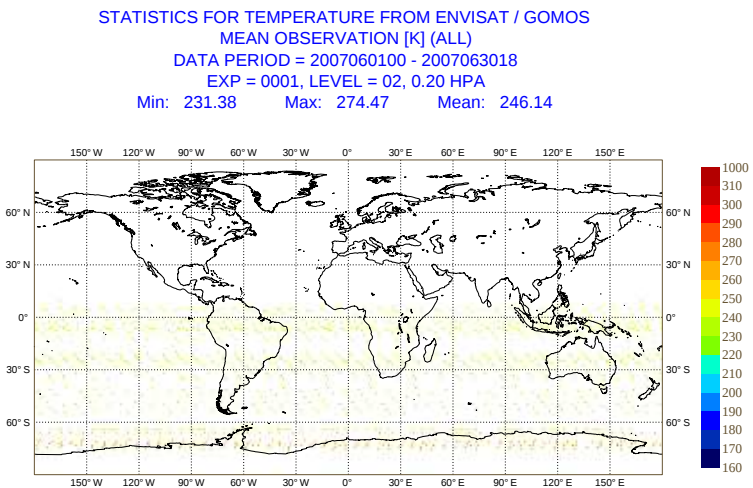


Fig. 16. As Fig. 15 but for level 9 (6.1 hPa) and level 13 (60 hPa).

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 June 2007.



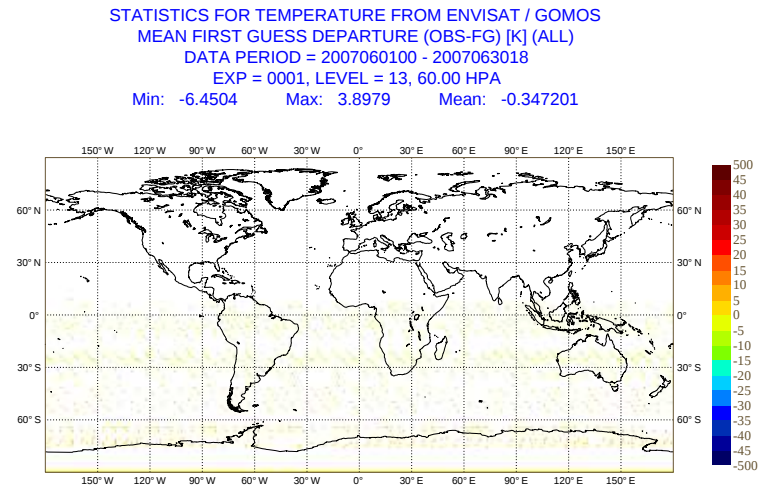
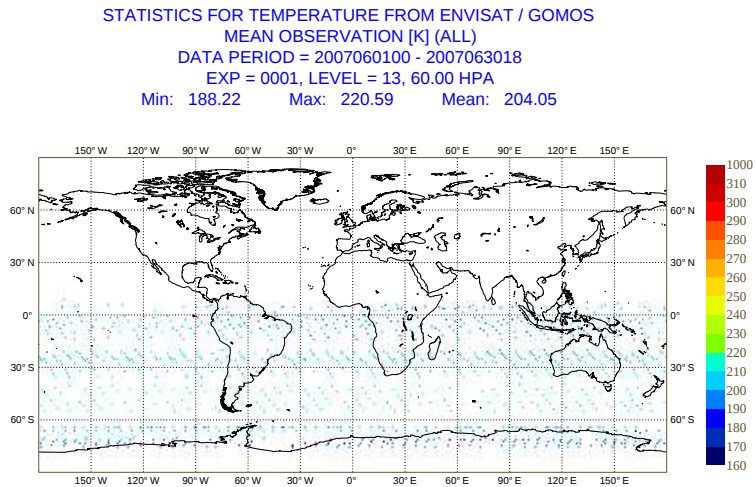
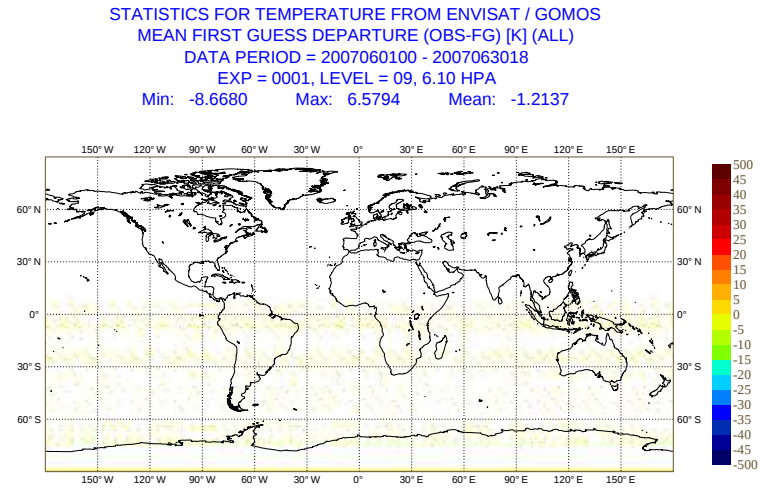
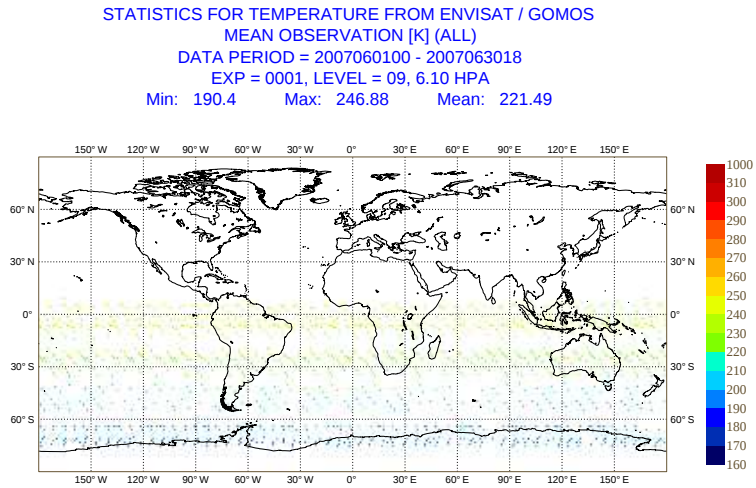


Fig. 18. As Fig. 18 but for level 9 (6.1 hPa) and level 13 (60 hPa).

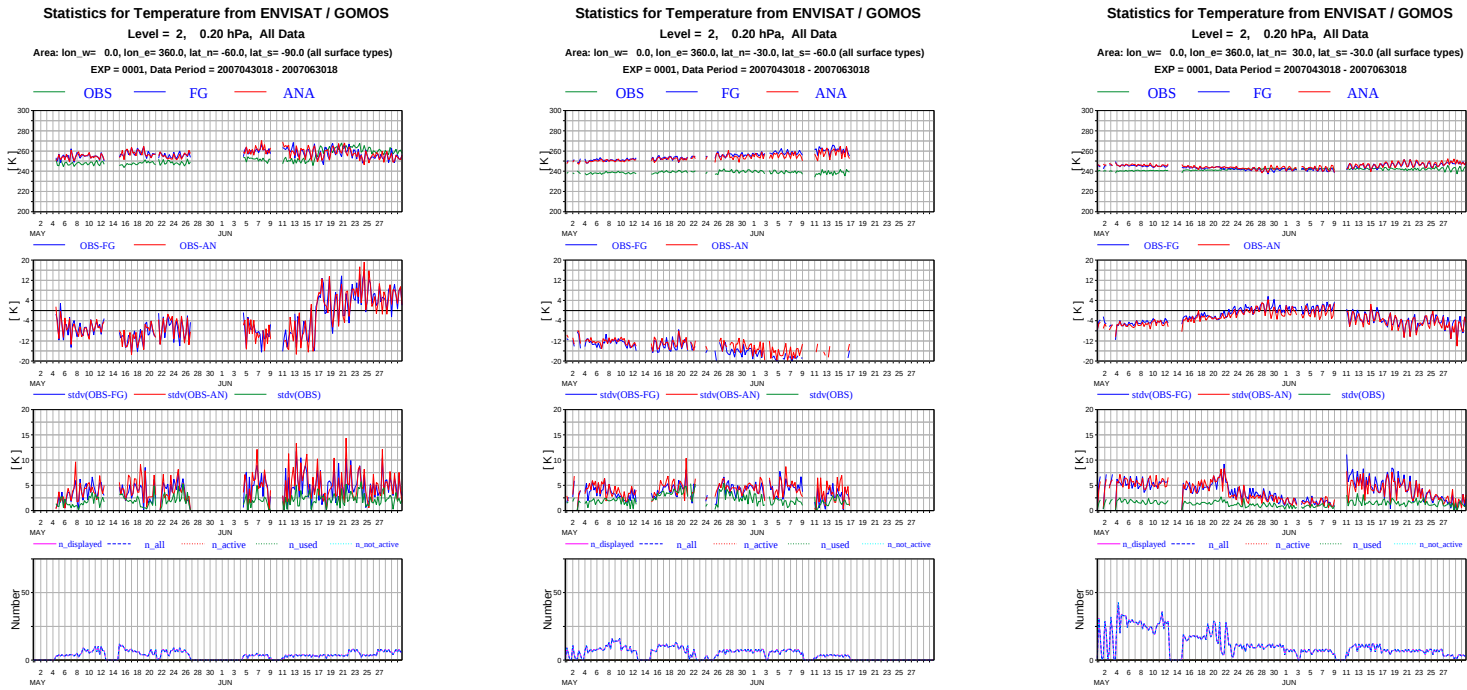


Fig. 19. Timeseries of mean ENVISAT GOMOS NRT temperature data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for level 2 (0.2 hPa) 30N-30S, 30-60S, and 60-90S for the period May-June 2007.

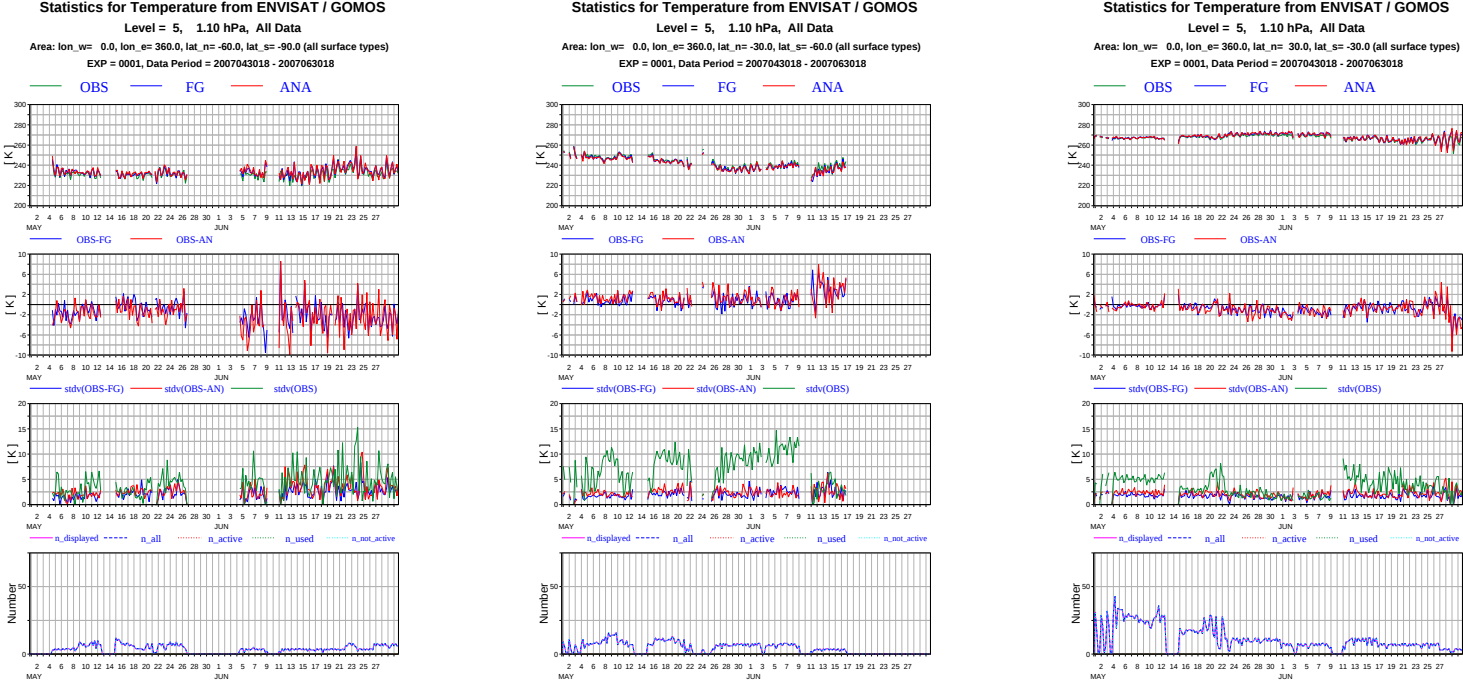


Fig. 20. As Figure 19, but for level 5 (1.1 hPa).

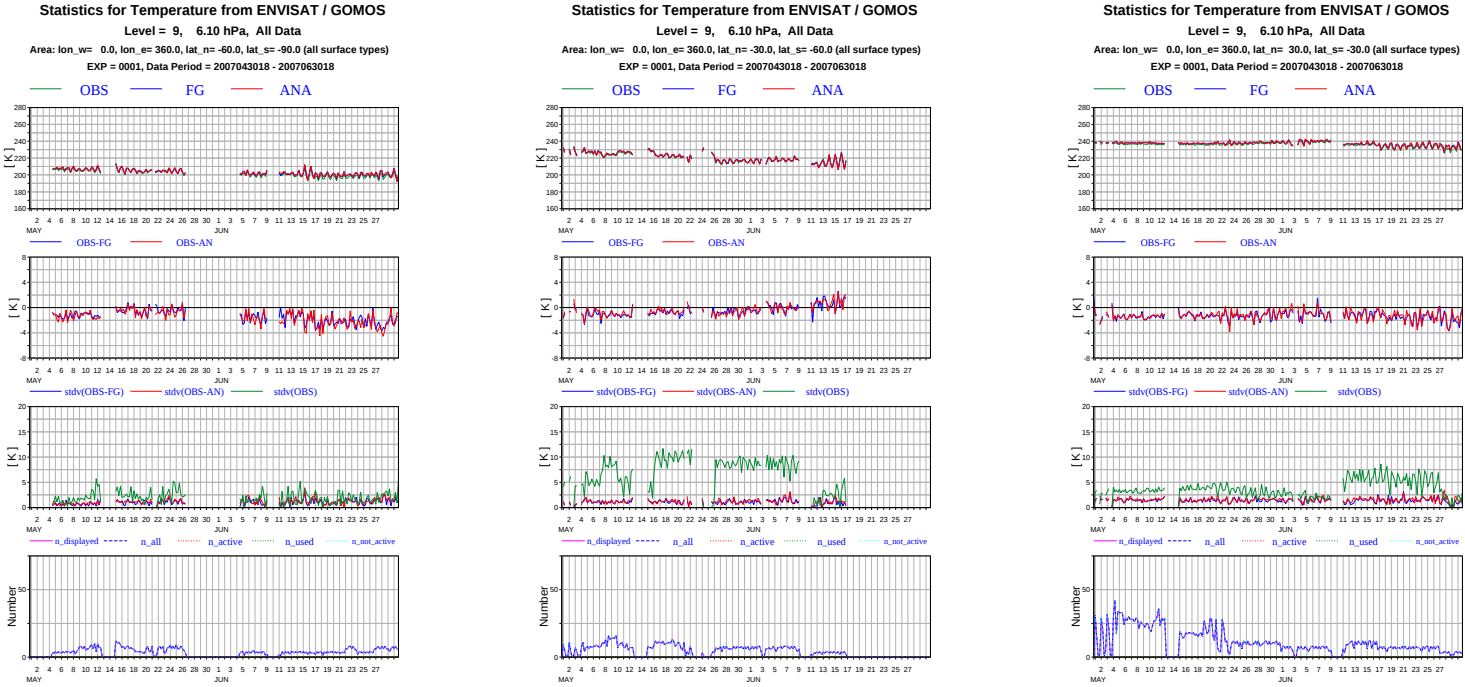


Fig. 21. As Figure 19, but for level 9 (6.1 hPa).

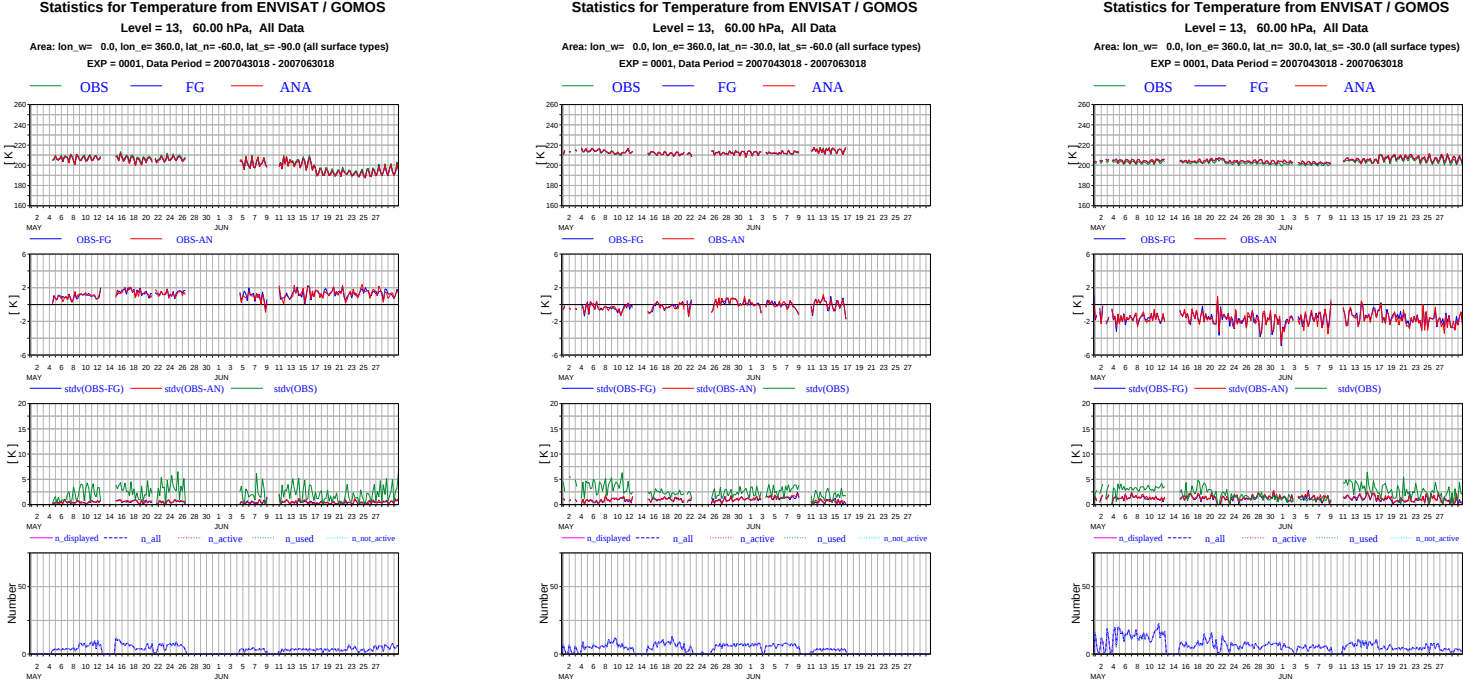


Fig. 22. As Figure 19, but for level 13 (60 hPa).

REPORT ABOUT ENVISAT GOMOS NRT OZONE DATA (GOM_RR_2P) FOR JUNE 2007

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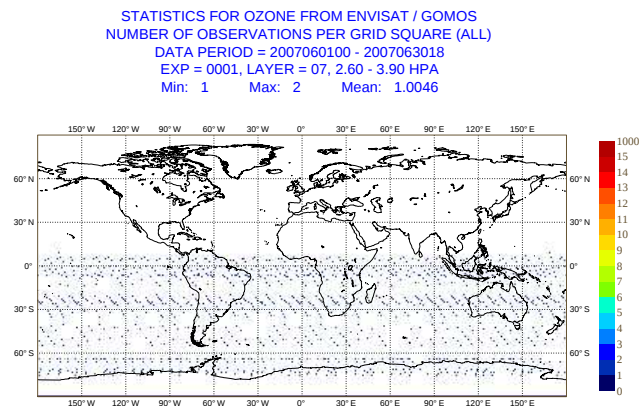


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT ozone data for layer 7 (2.60-3.90 hPa) for June 2007.

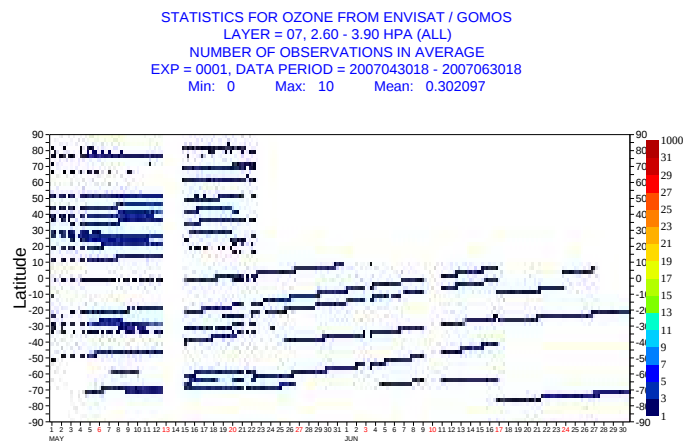


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT ozone data per 6-hour cycle for layer 7 (2.60-3.90 hPa) for May-June 2007.

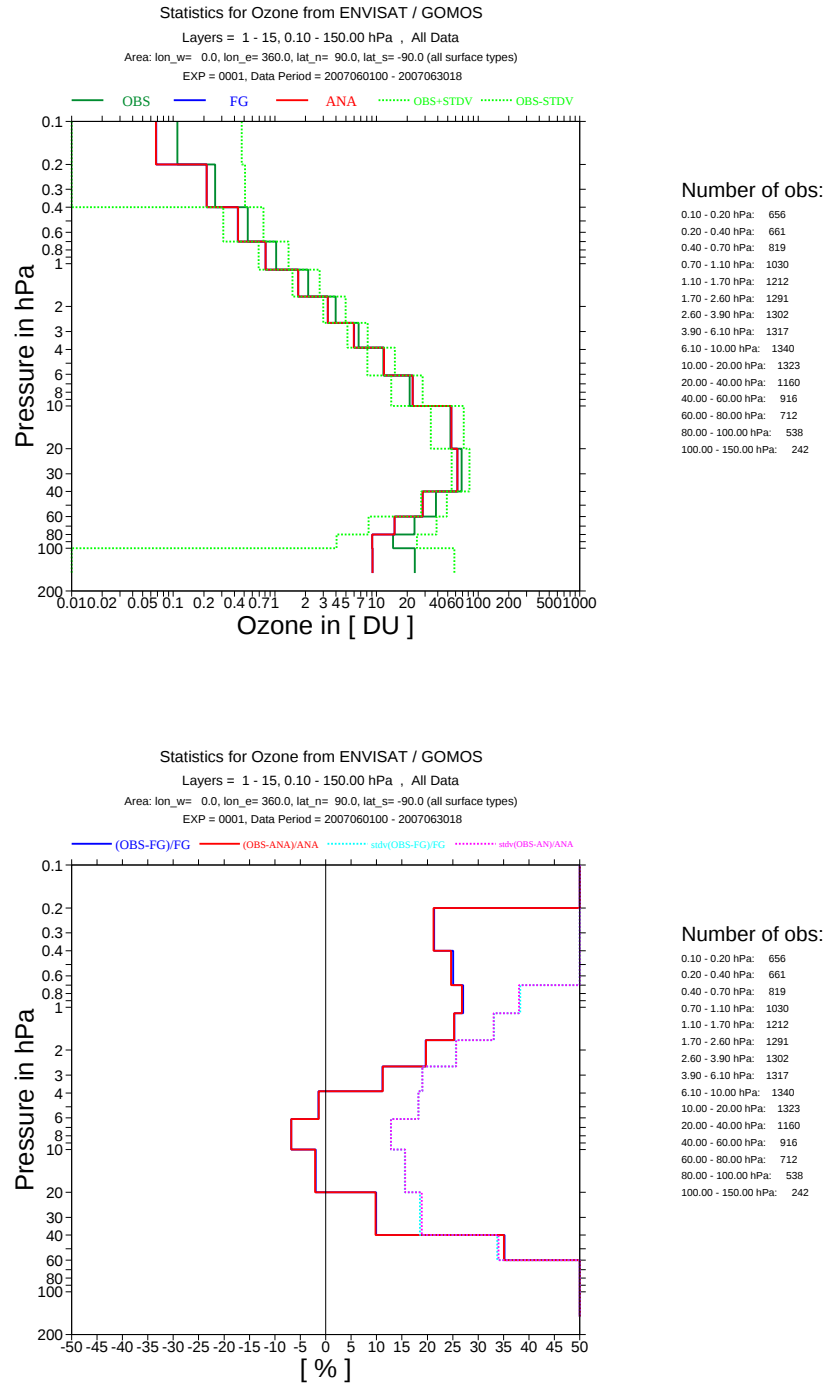


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT ozone data in DU for June 2007 (global mean). The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (red), and the mean observation (green) $\pm$ 1 standard deviation (green dotted lines). The 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.

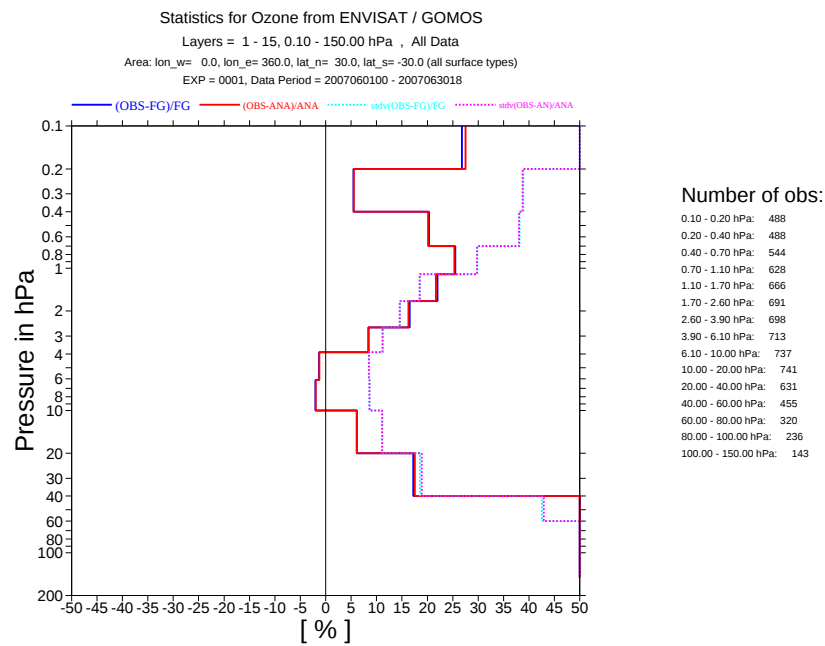
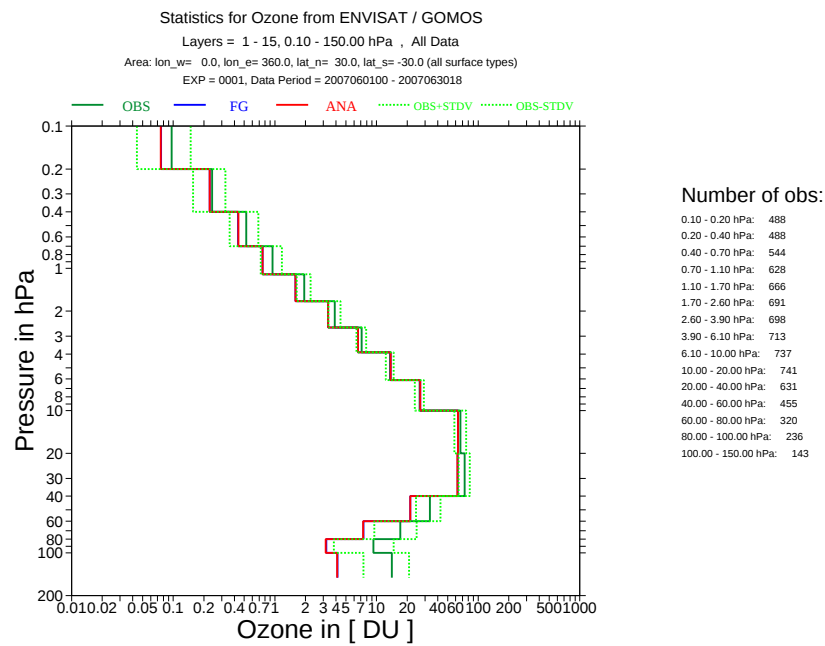


Fig. 4. As Fig. 3 but for 30N-30S.

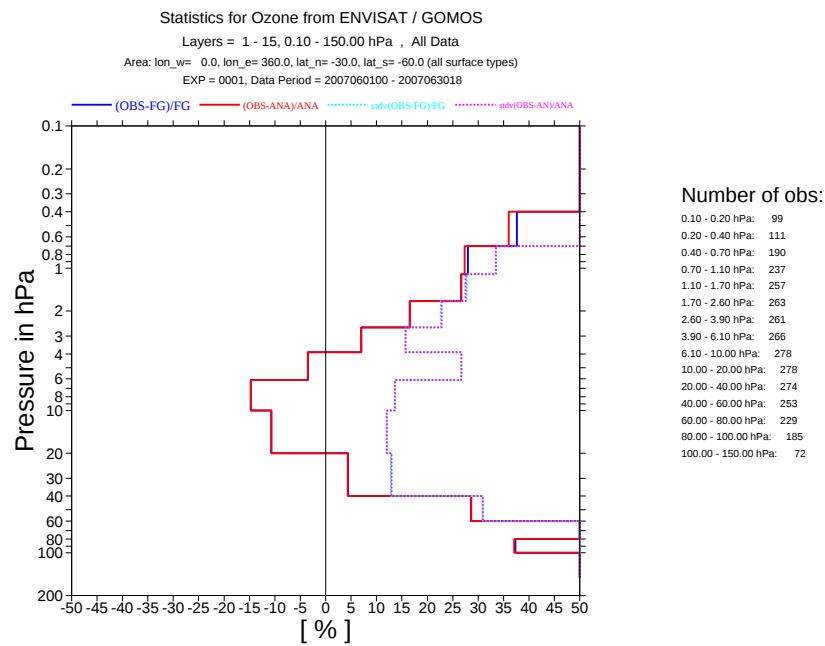
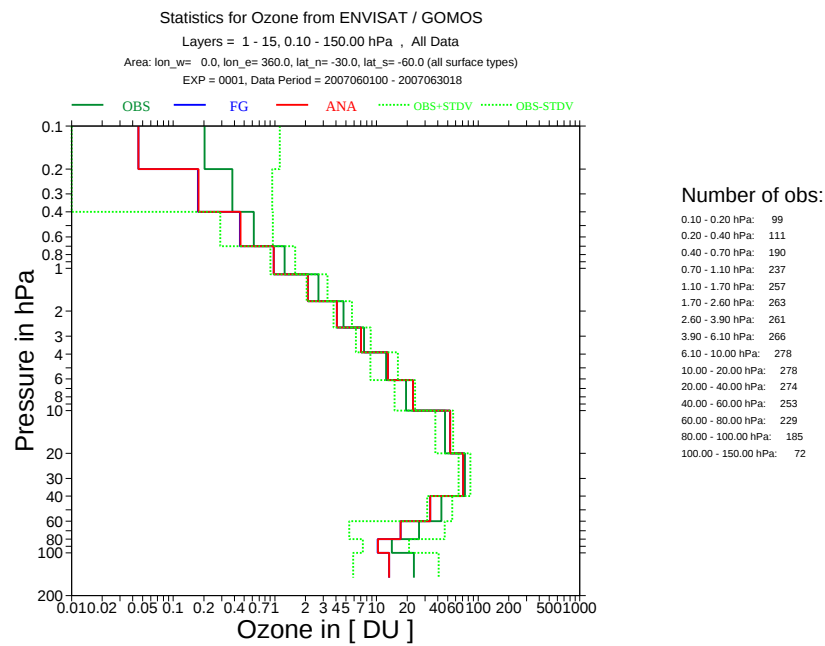


Fig. 5. As Fig. 3 but for 30S-60S.

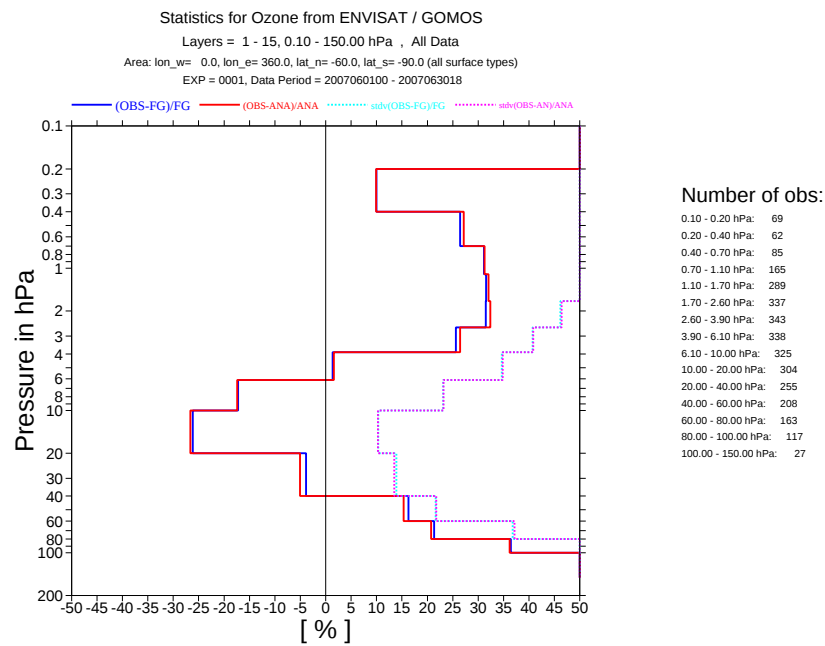
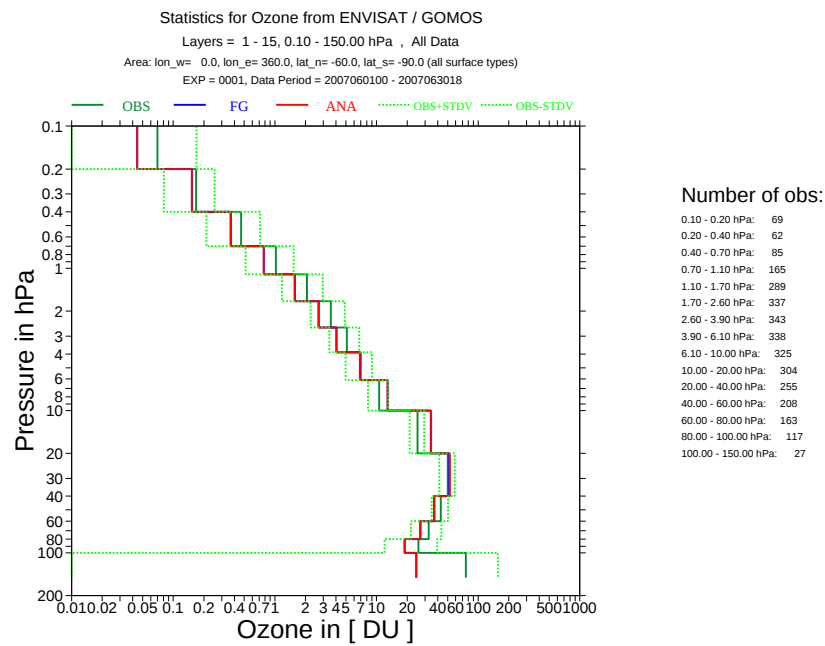


Fig. 6. As Fig. 3 but for 60-90S.

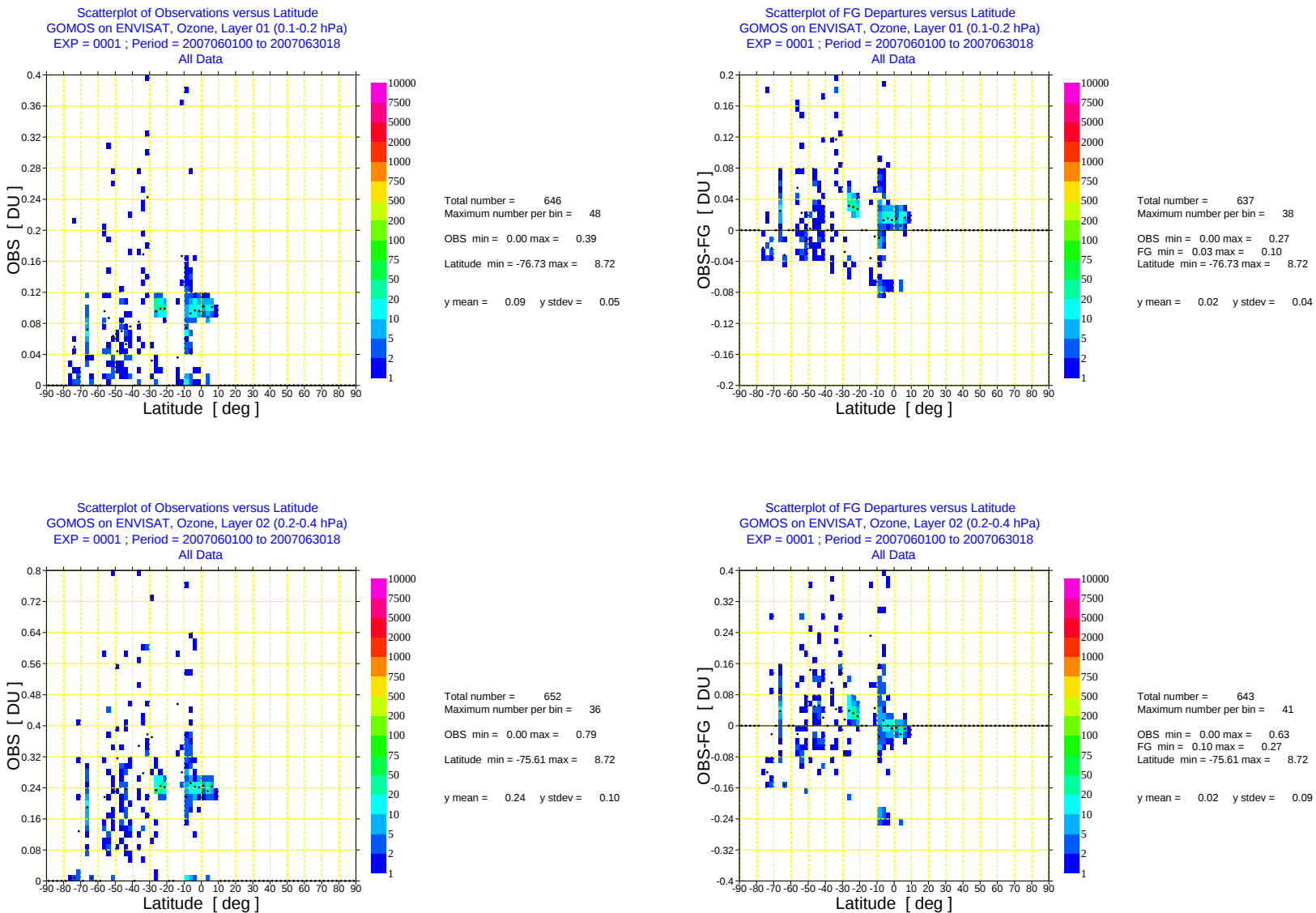


Fig. 7. Scatter plot of ENVISAT GOMOS NRT ozone data against latitude (right) and scatter plot of first-ness departures of ENVISAT GOMOS NRT ozone data against latitude (right) for June 2007 for layer 1 (0.1-0.2 hPa) and layer 2 (0.2-0.4 hPa). The colours show the number of data per bin, the black dots the mean value per bin.

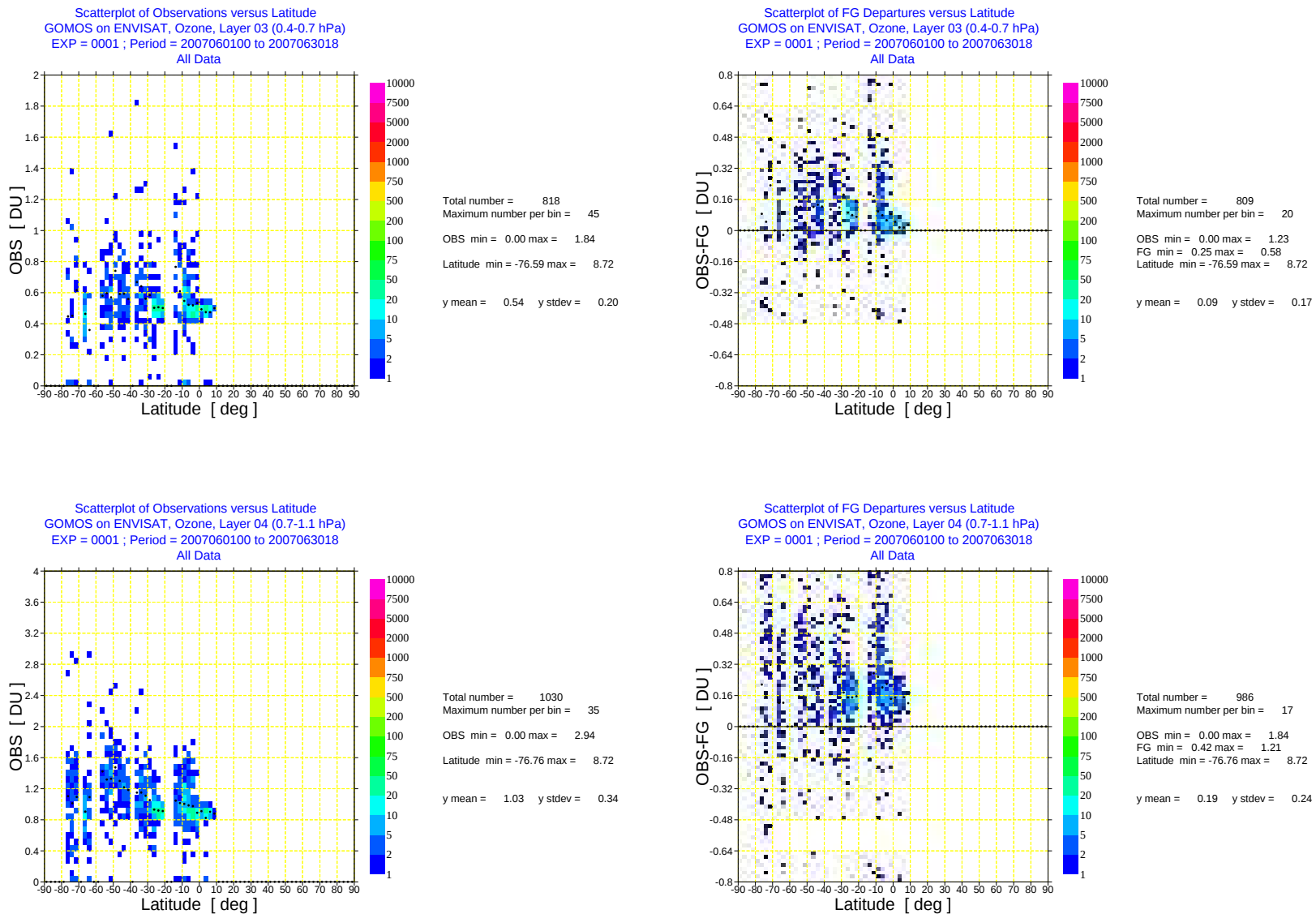


Fig. 8. As Fig. 7 but for layer 3 (0.4-0.7 hPa) and layer 4 (0.7-1.1 hPa).

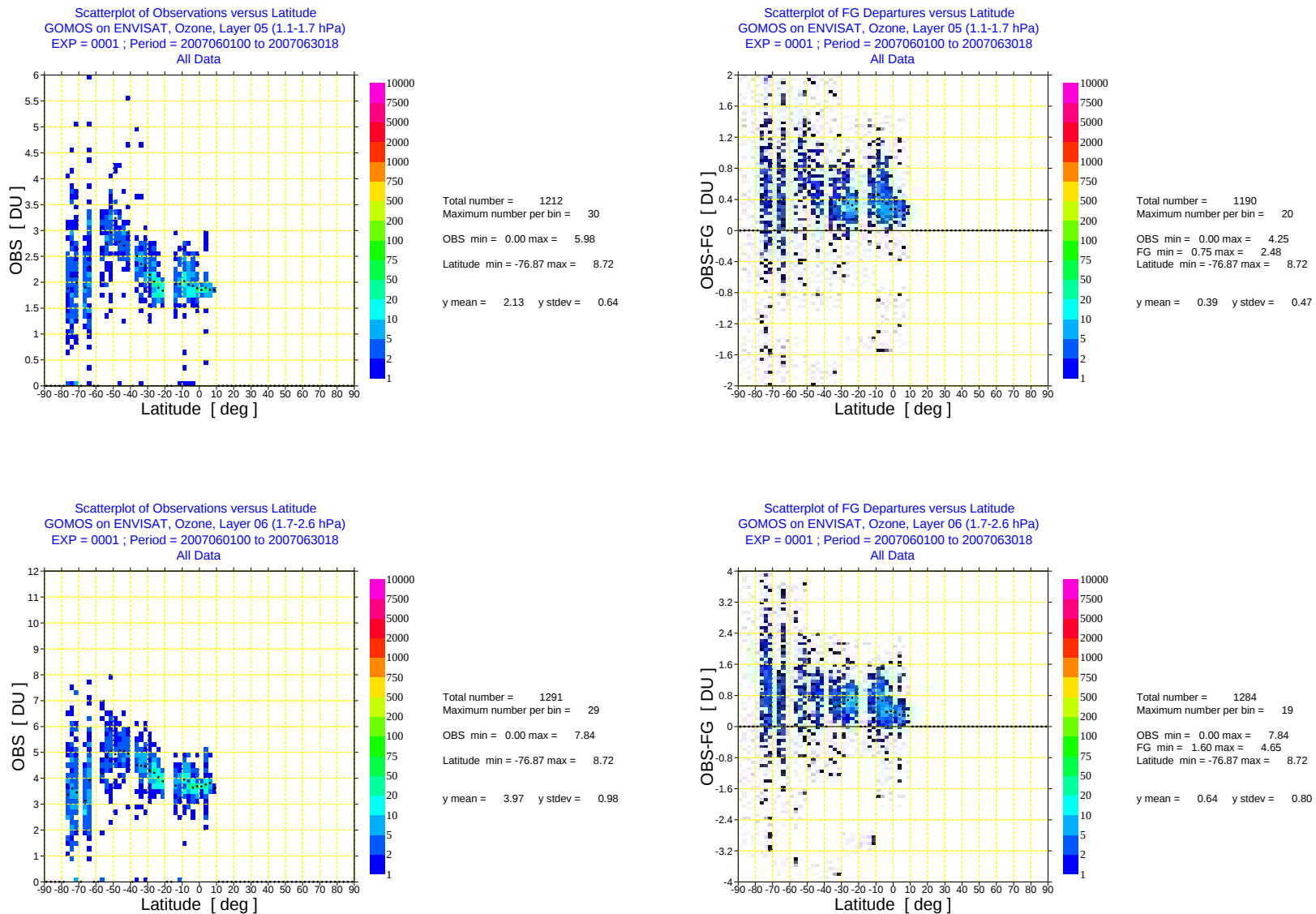


Fig. 9. As Fig. 7 but for layer 5 (1.1-1.7 hPa) and layer 6 (1.7-2.6 hPa).

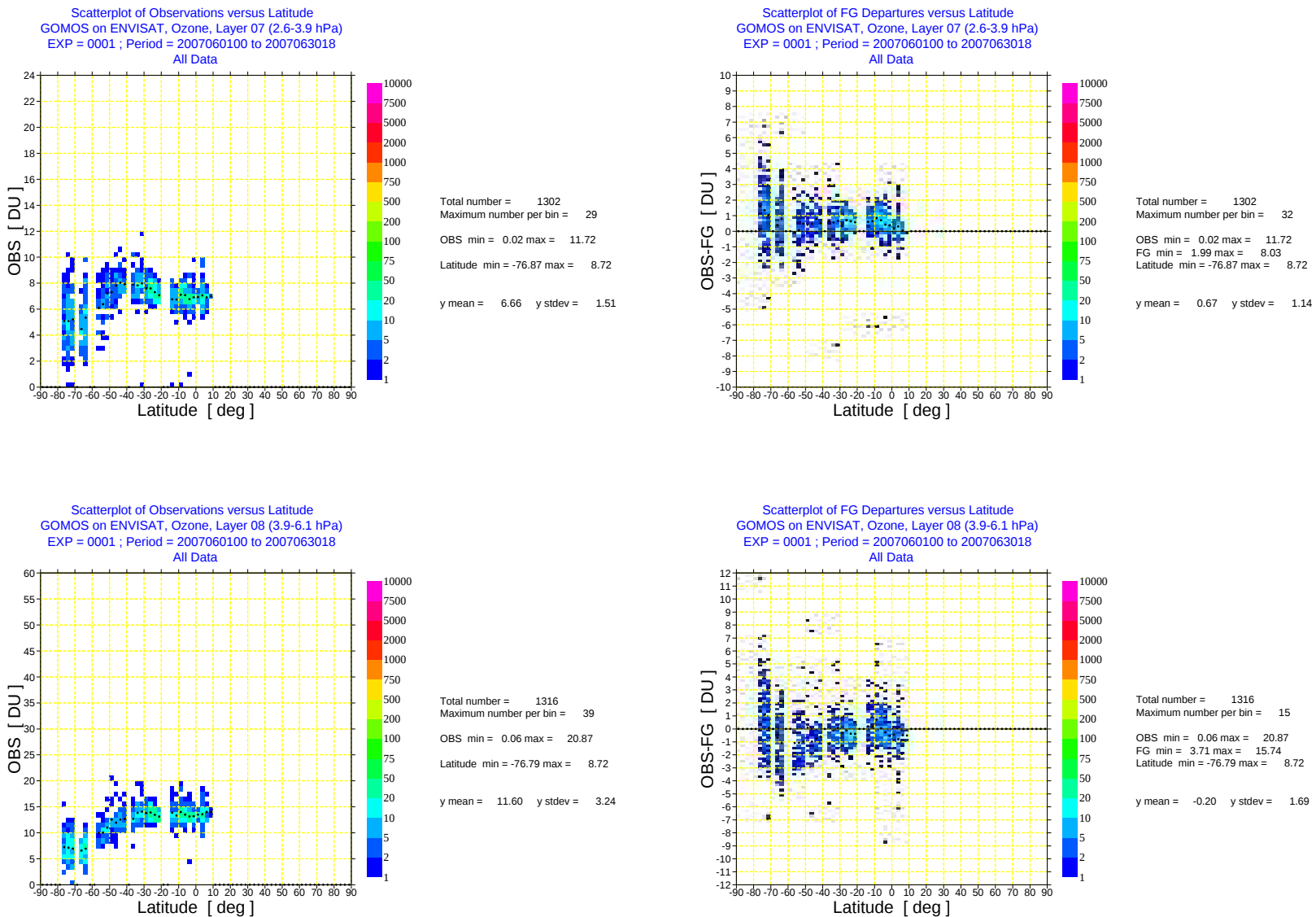


Fig. 10. As Fig. 7 but for layer 7 (2.6-3.9 hPa) and layer 8 (3.9-6.1 hPa).

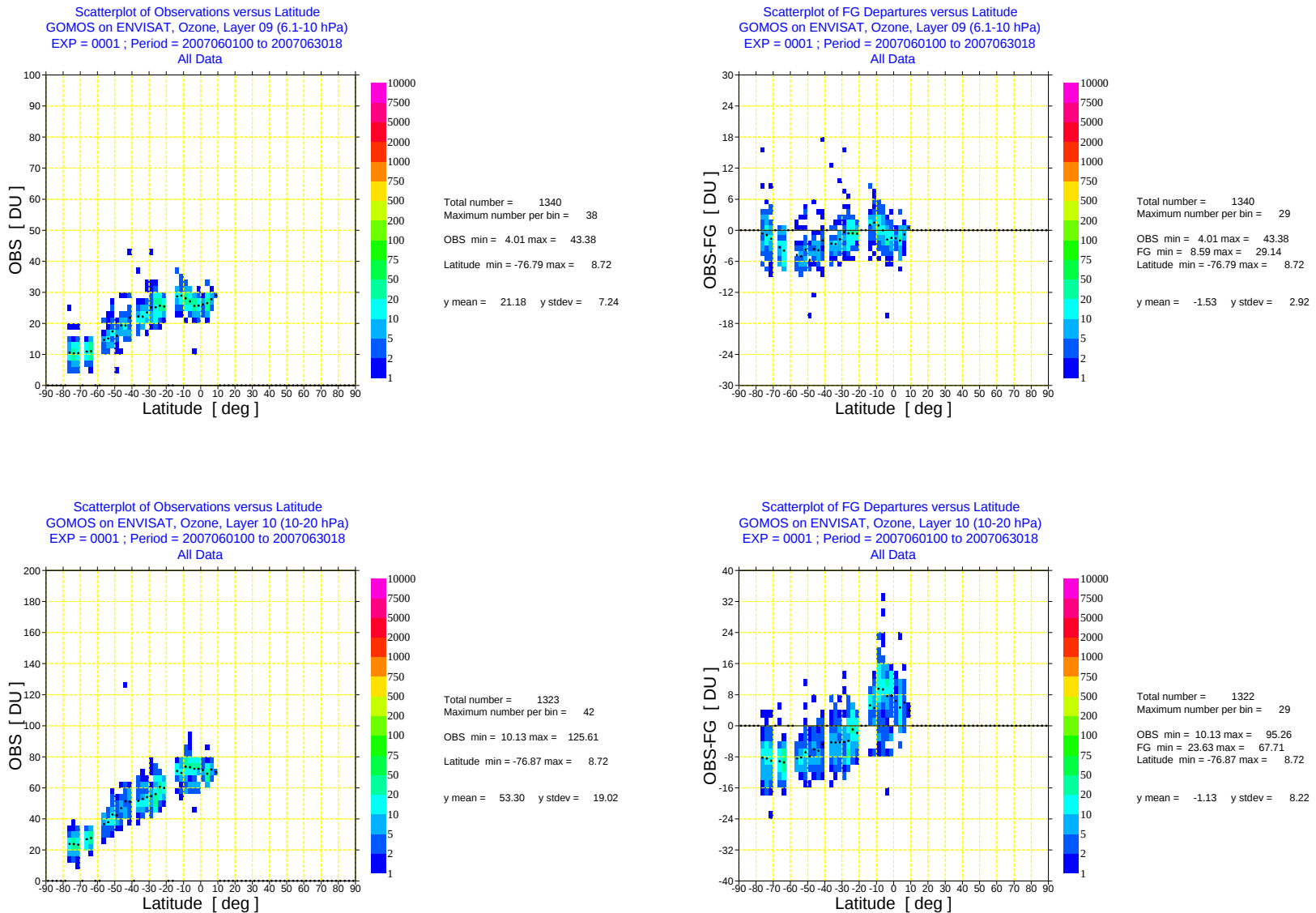


Fig. 11. As Fig. 7 but for layer 9 (6.1-10 hPa) and layer 10 (10-20 hPa).

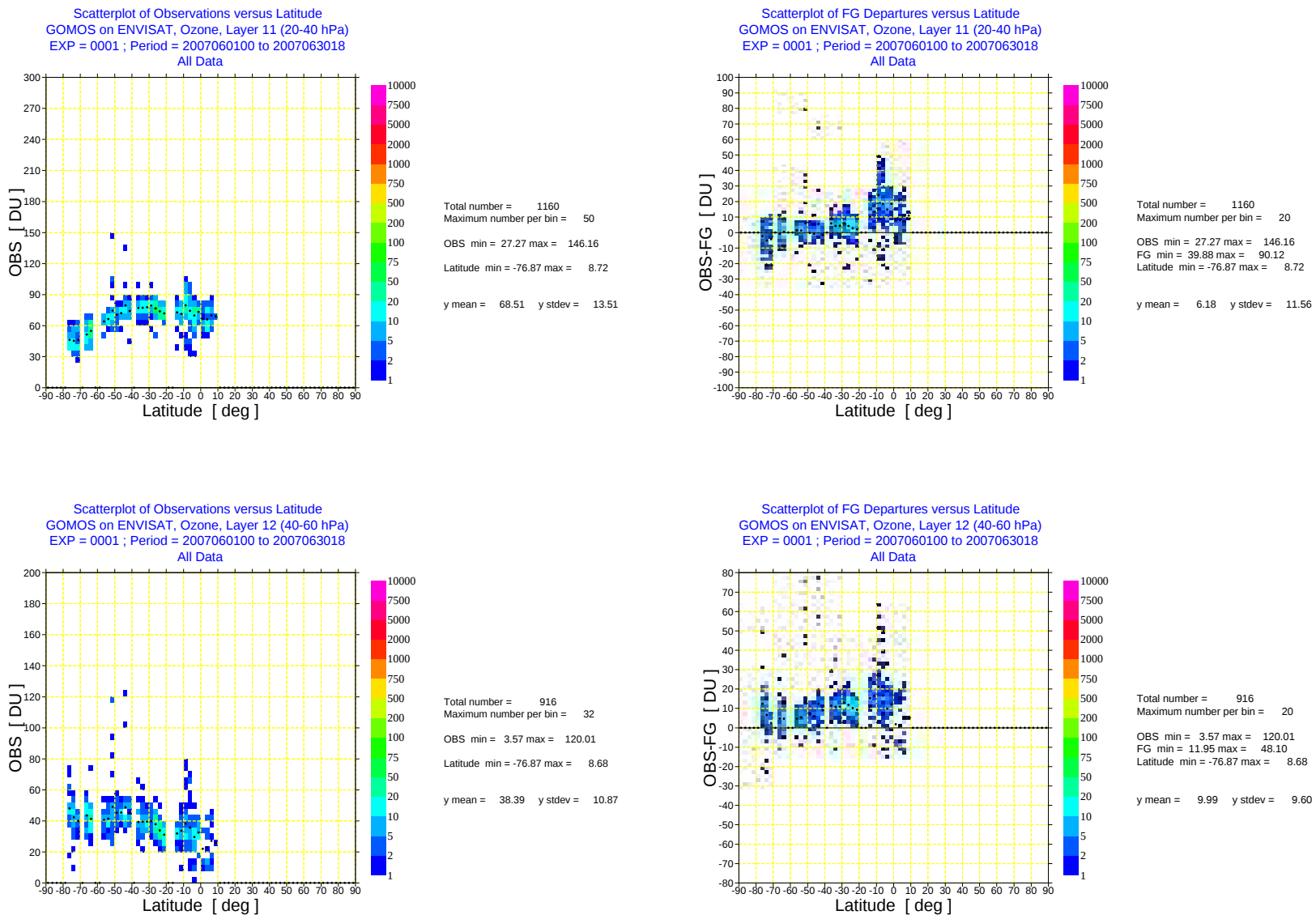


Fig. 12. As Fig. 7 but for layer 11 (20-40 hPa) and layer 12 (40-60 hPa).

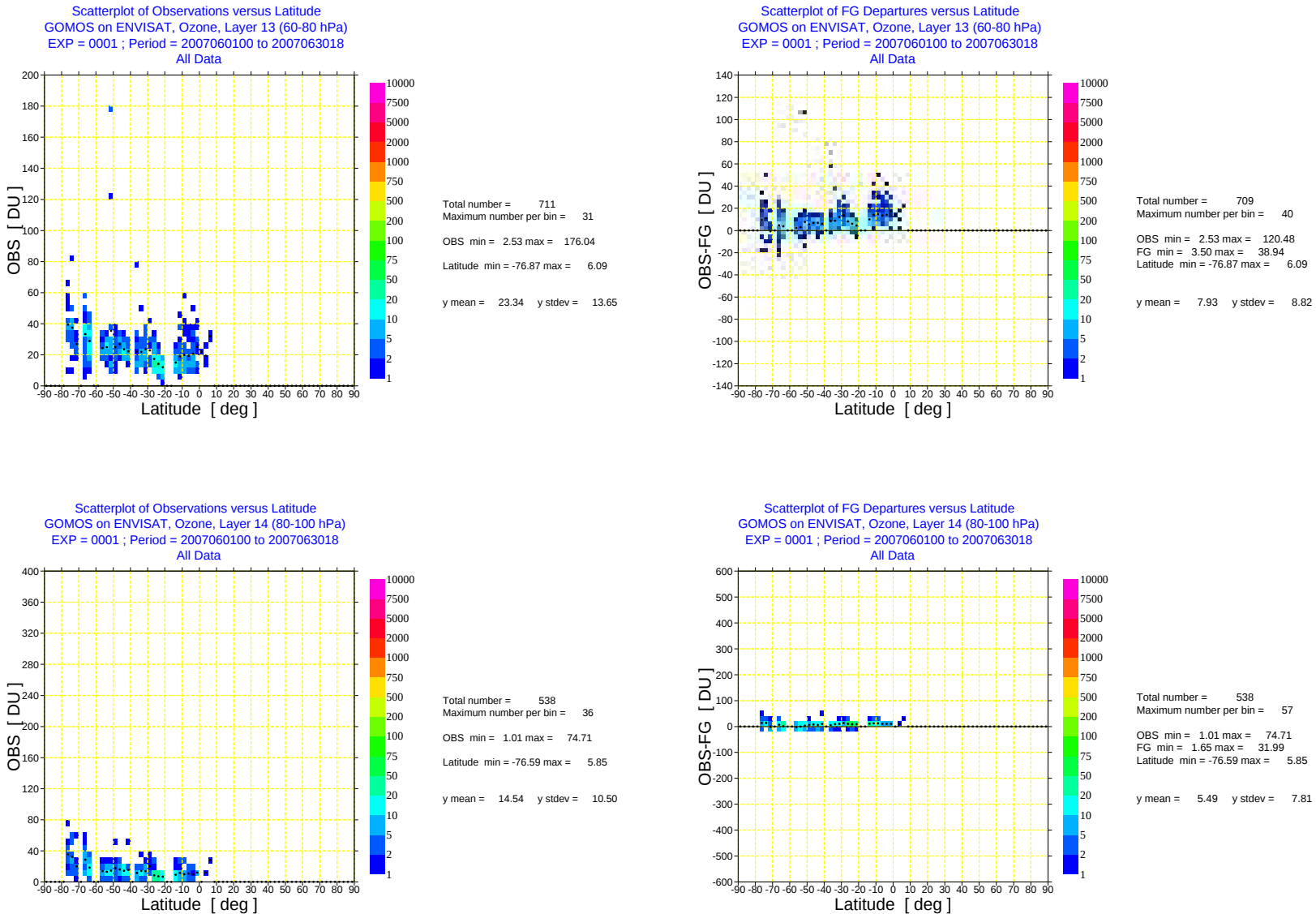


Fig. 13. As Fig. 7 but for layer 13 (60-80 hPa) and layer 14 (80-100 hPa).

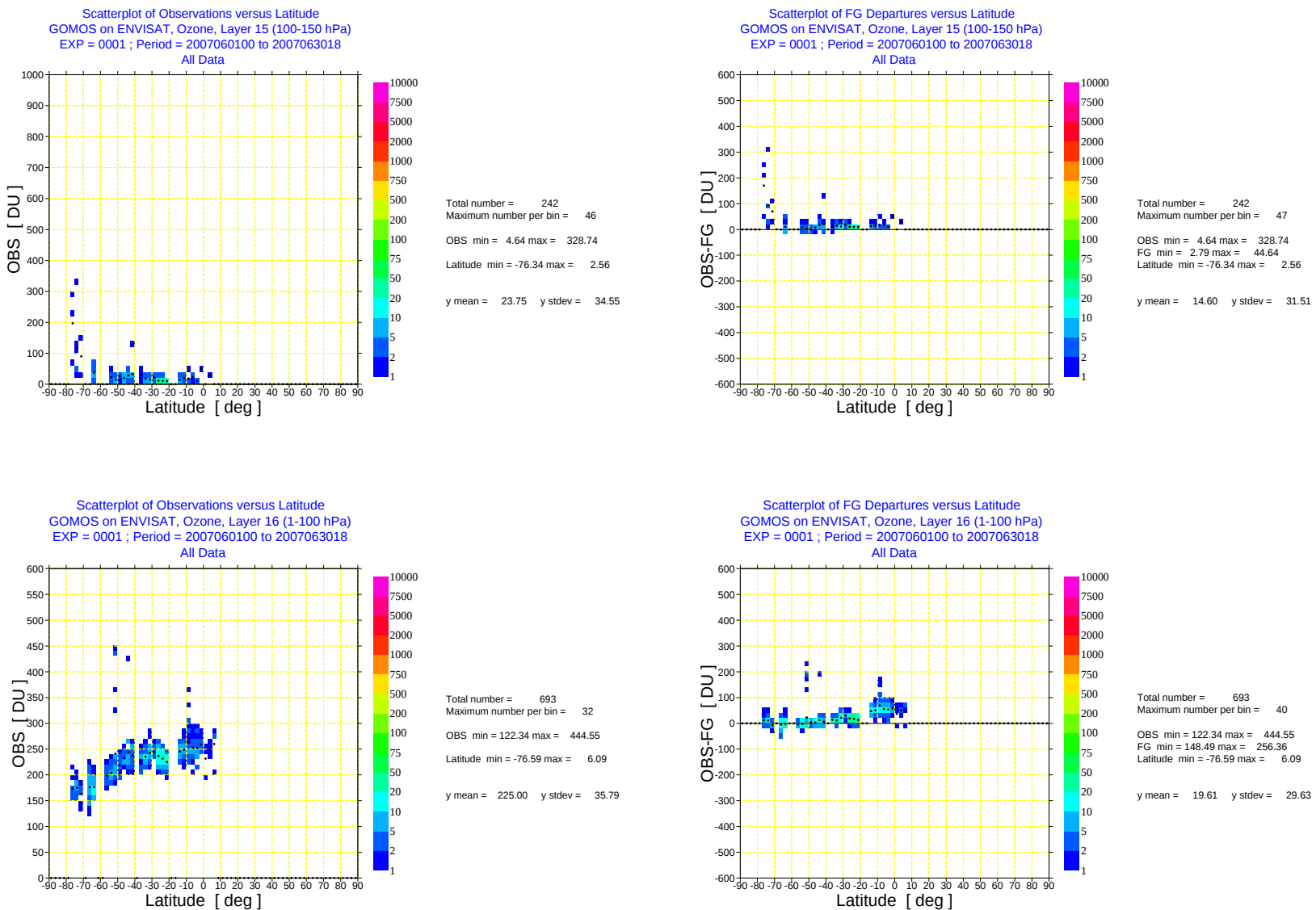


Fig. 14. As Fig. 7 but for layer 15 (100-150 hPa) and layer 16 (1-100 hPa).

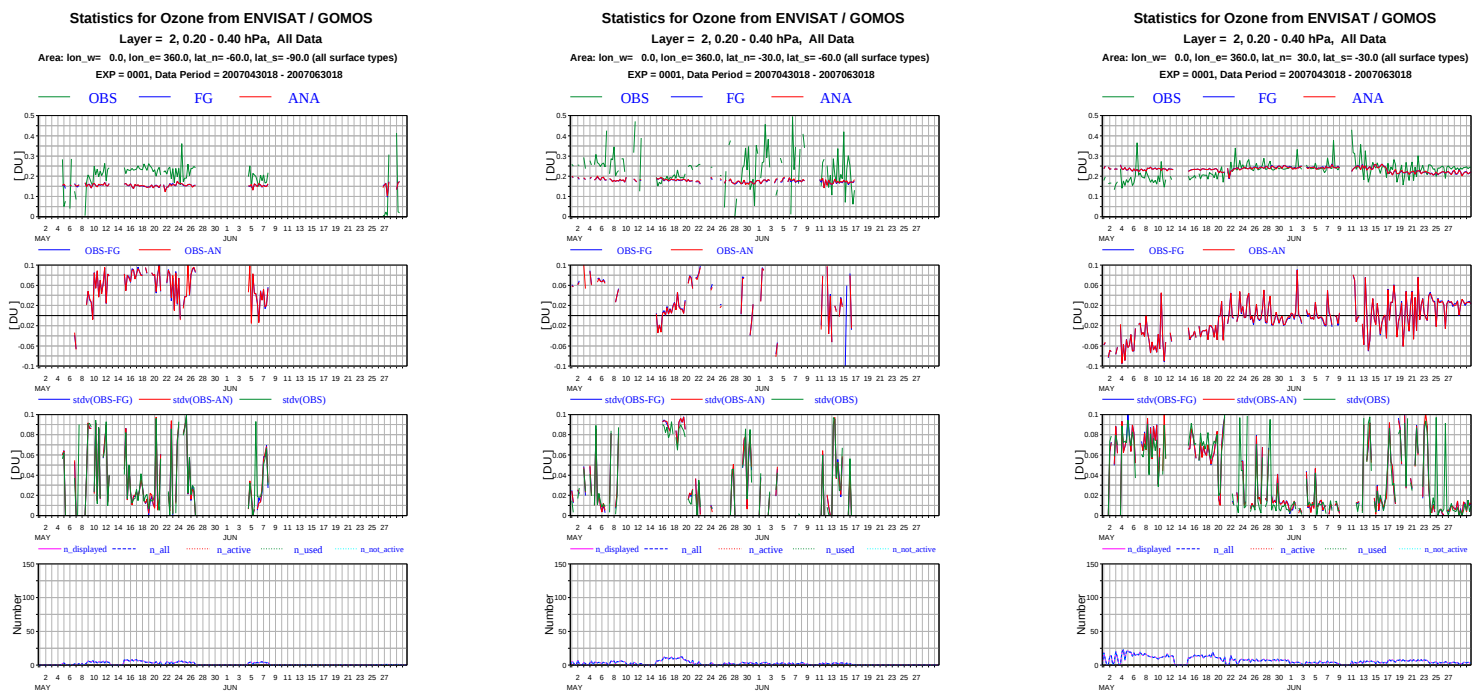


Fig. 15. Timeseries of mean ENVISAT GOMOS NRT ozone data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for layer 2 (0.2-0.4 hPa) 30N-30S, 30-60S, and 60-90S for the period May-June 2007.

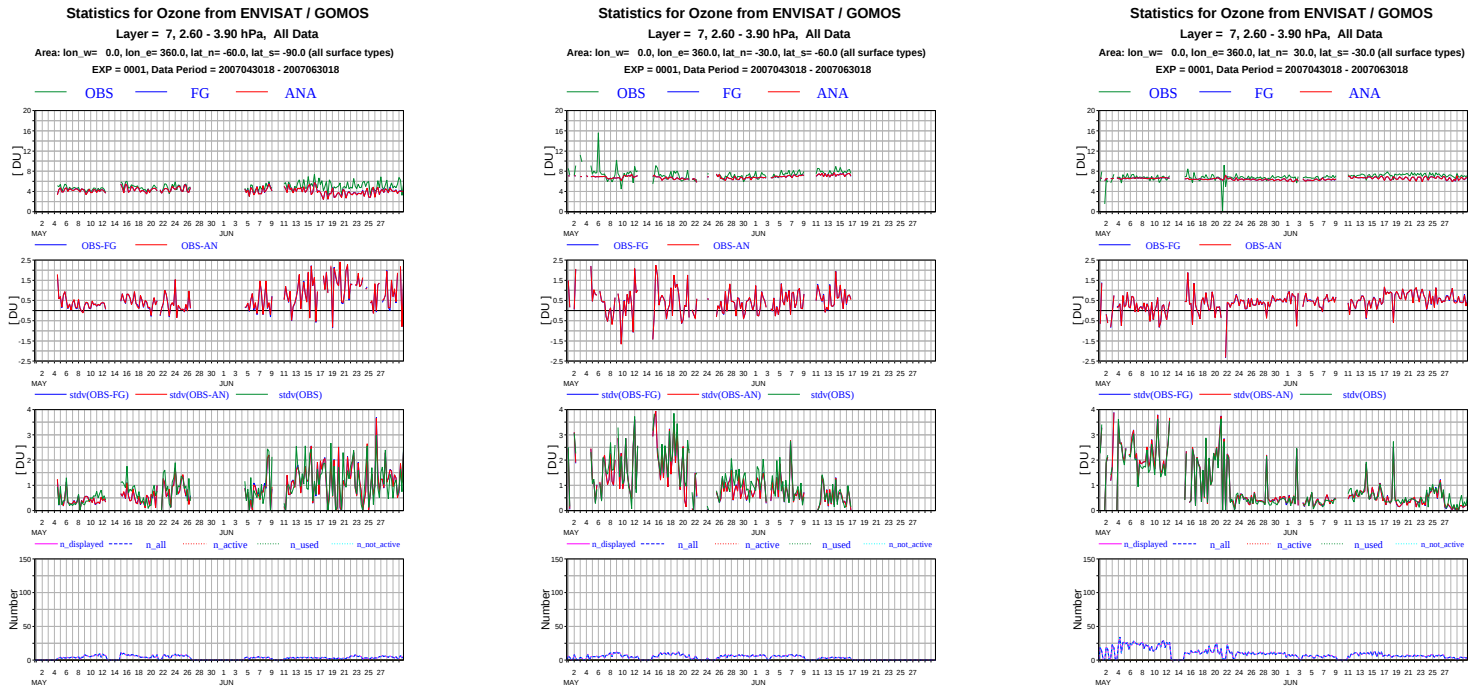


Fig. 16. As Figure 15, but for layer 7 (2.6-3.9 hPa).

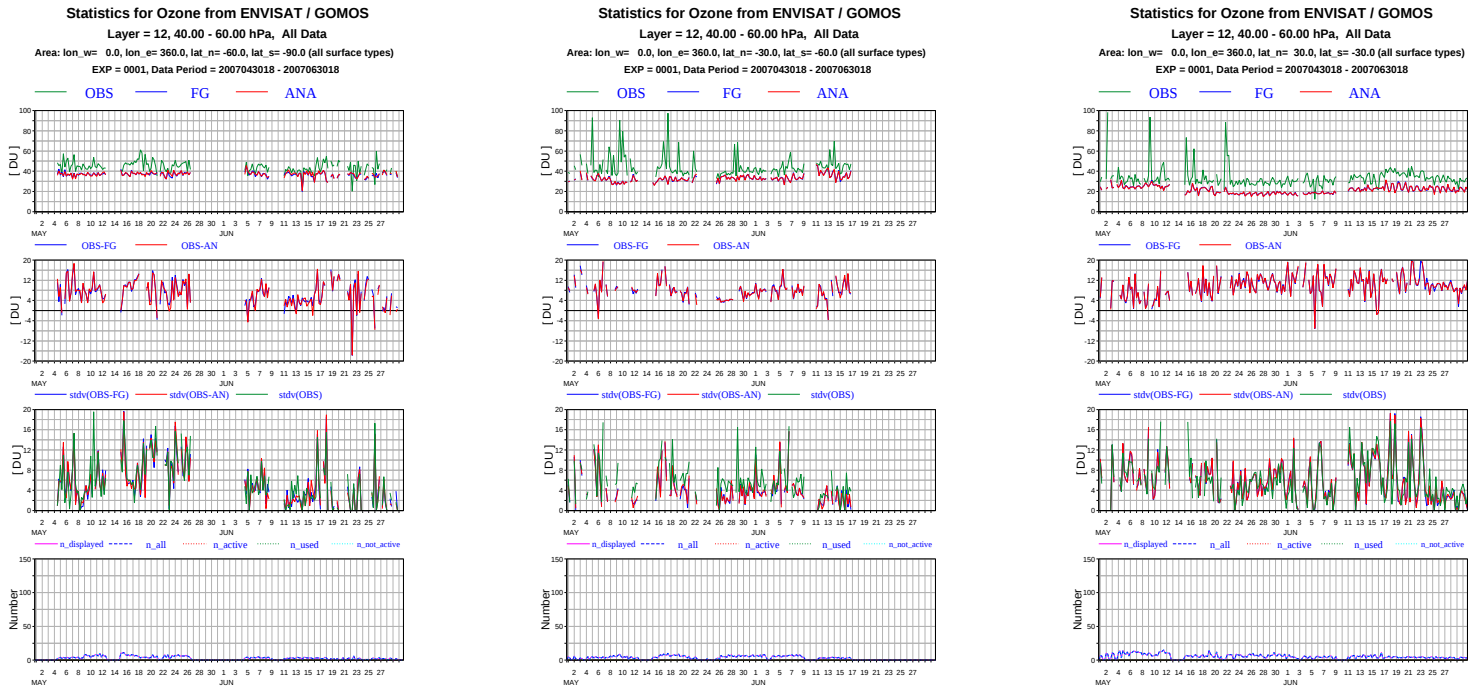


Fig. 17. As Figure 15, but for layer 12 (40-80 hPa).

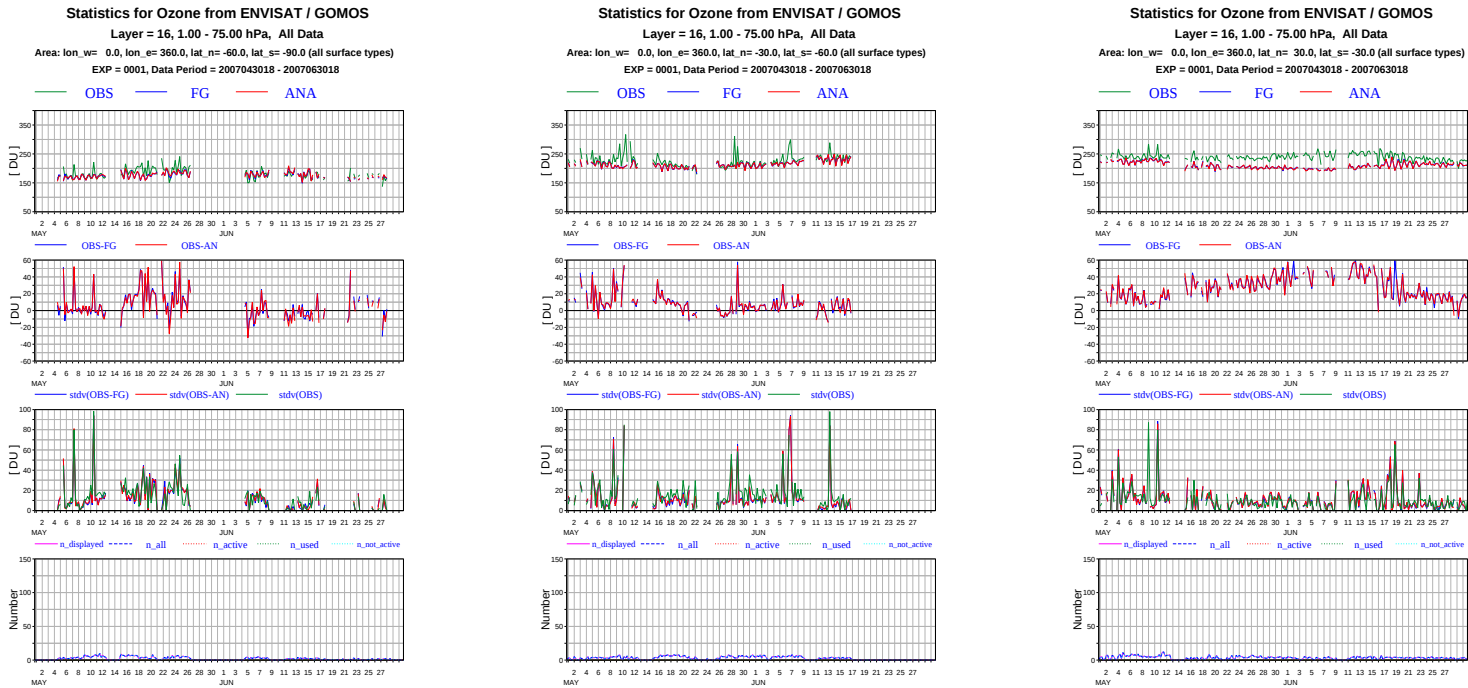


Fig. 18. As Figure 15, but for layer 16 (1-100 hPa).

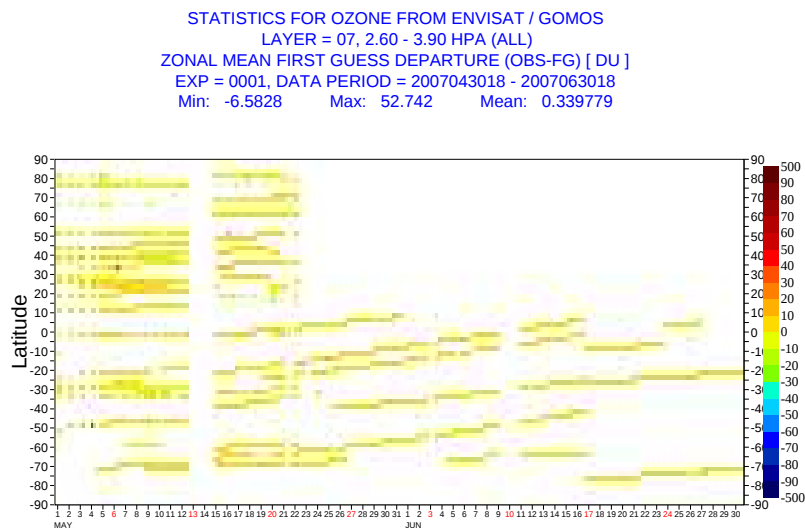
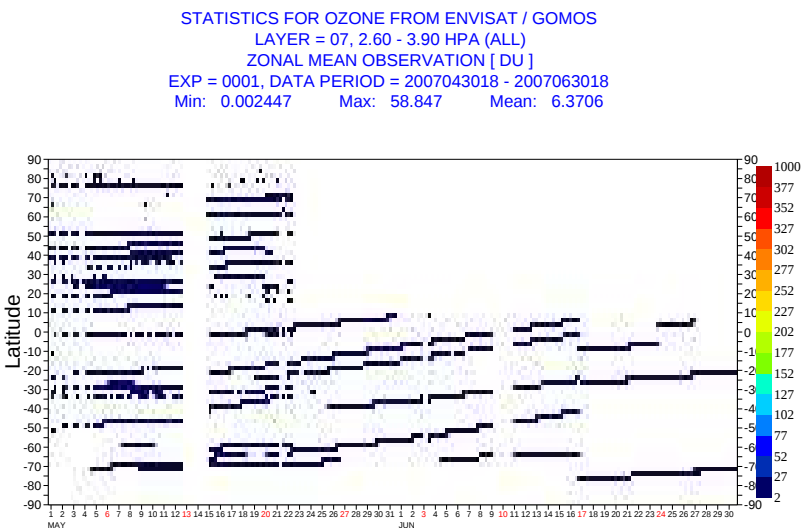
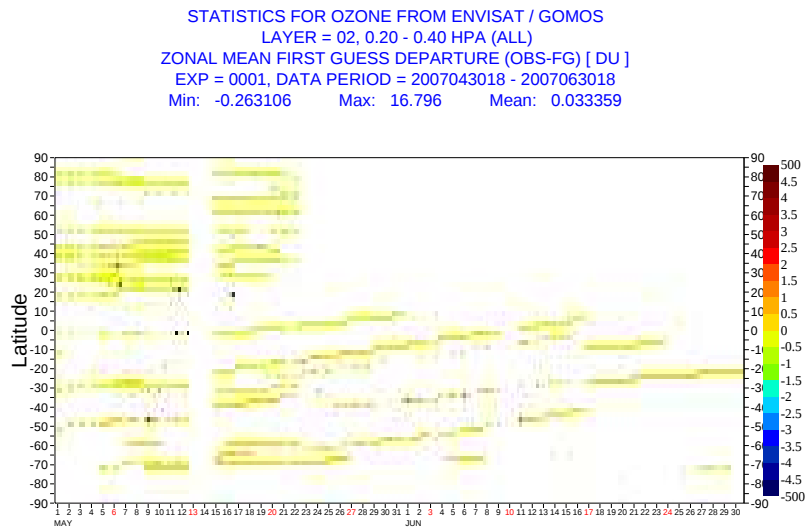
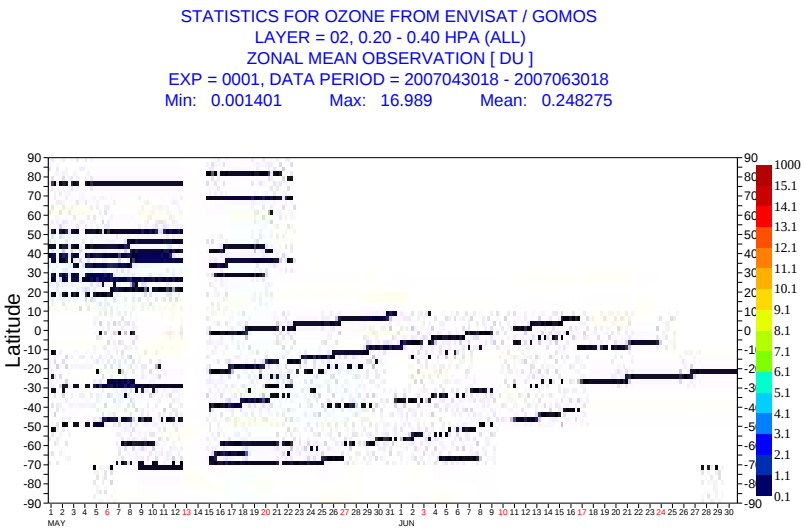


Fig. 19. Hovmöller diagram of zonal mean ENVISAT GOMOS NRT ozone data per 6-hour cycle for May-June 2007 and of the zonal mean first-guess departures for layer 2 (0.2-0.4 hPa) and layer 7 (2.6-3.9 hPa).

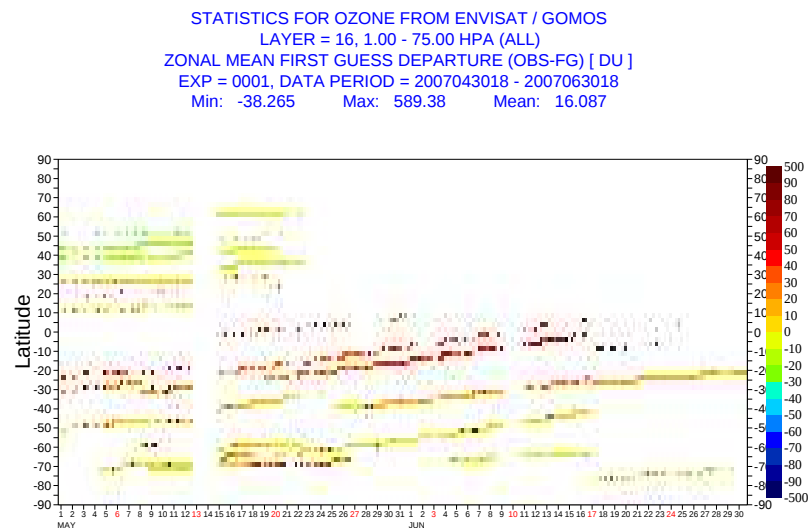
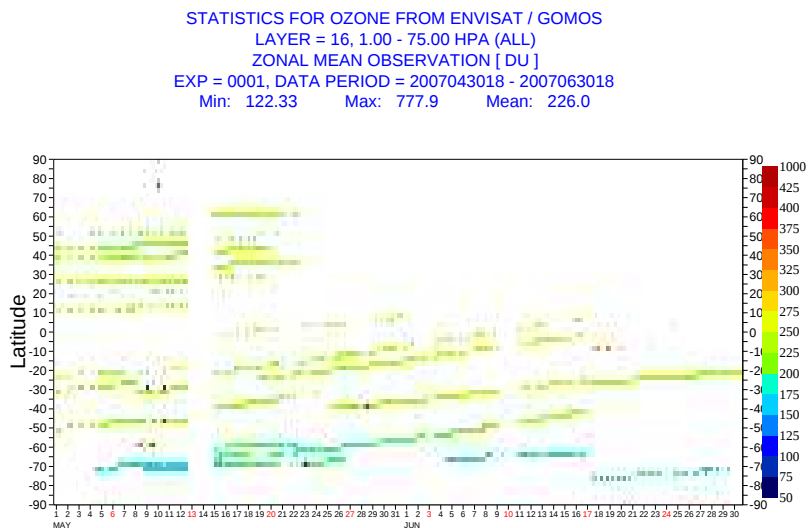
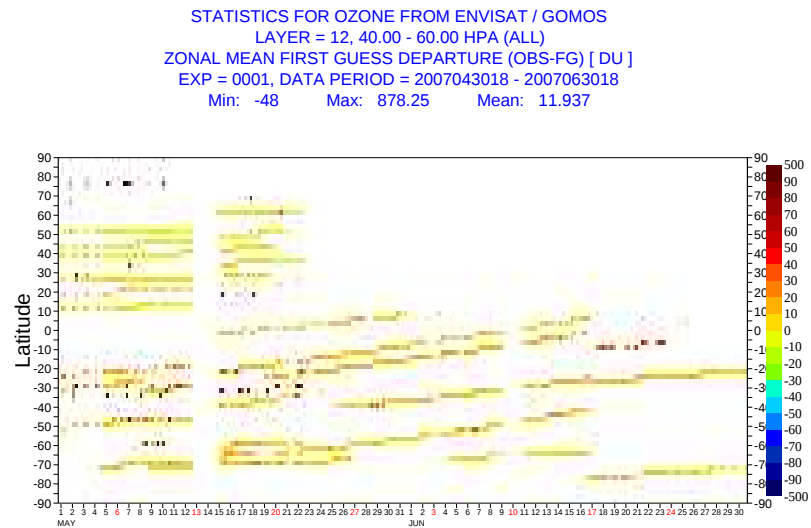
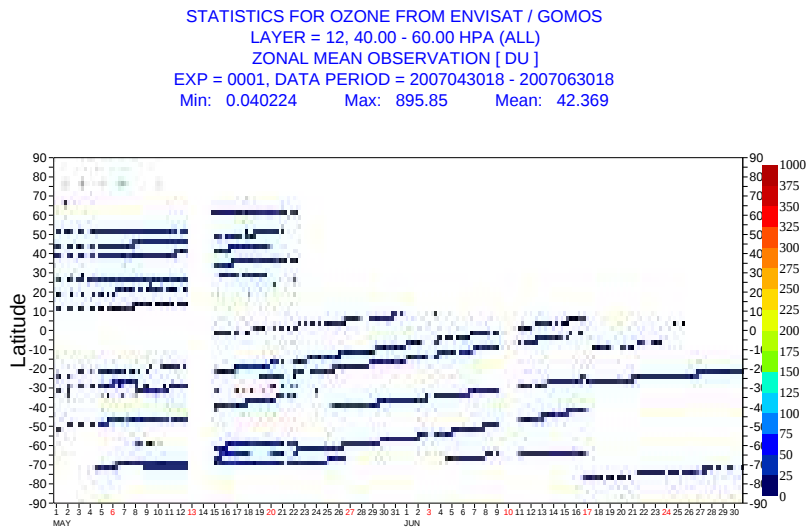


Fig. 20. As Fig. 19 but for layer 12 (40-60 hPa) and layer 16 (1-100 hPa).

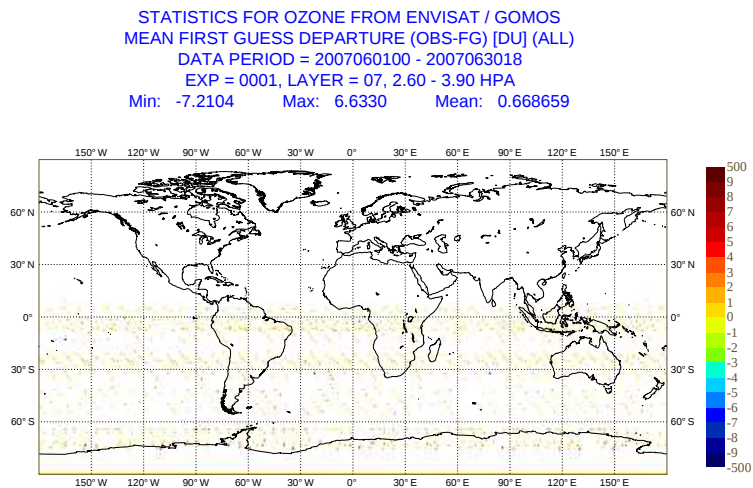
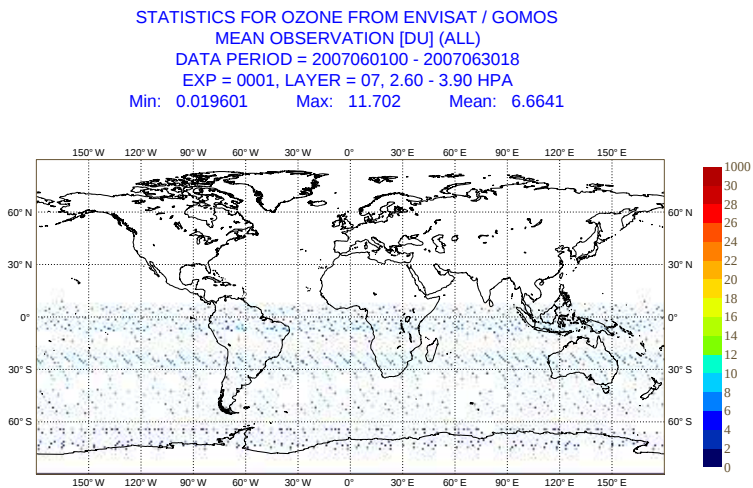
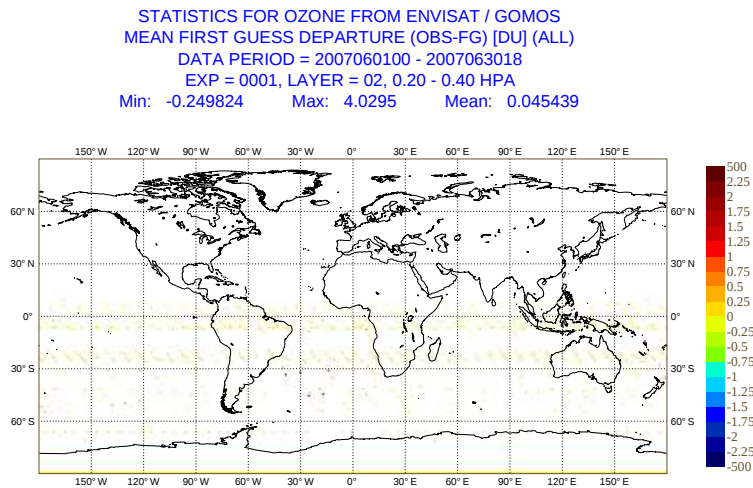
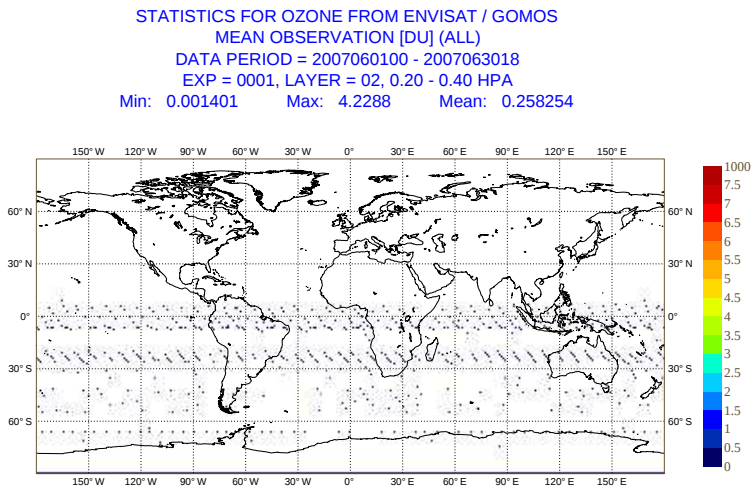
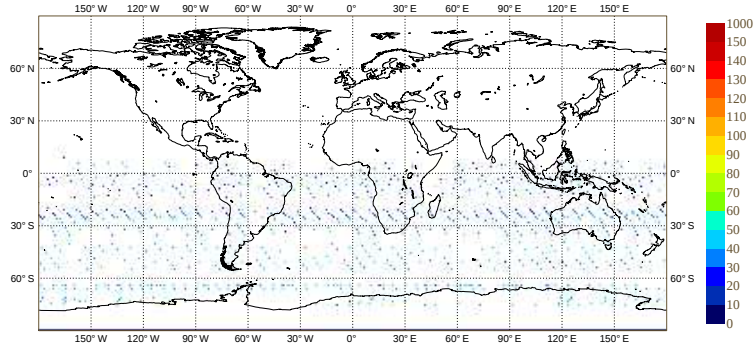
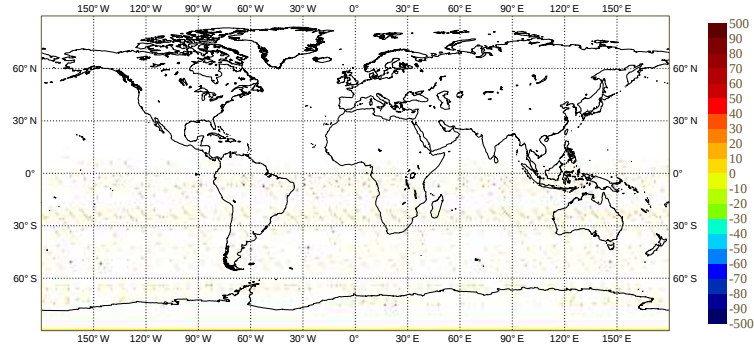


Fig. 21. Geographical distribution of mean ENVISAT GOMOS NRT ozone data and mean first-guess departures for June 2007 for layer 2 (0.2-0.4 hPa) and layer 7 (2.6-3.9 hPa).

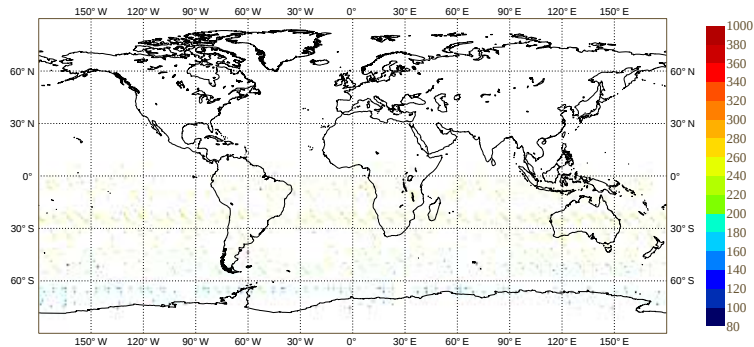
STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN OBSERVATION [DU] (ALL)
DATA PERIOD = 2007060100 - 2007063018
EXP = 0001, LAYER = 12, 40.00 - 60.00 HPA
Min: 3.5690 Max: 120.0 Mean: 38.393



STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN FIRST GUESS DEPARTURE (OBS-FG) [DU] (ALL)
DATA PERIOD = 2007060100 - 2007063018
EXP = 0001, LAYER = 12, 40.00 - 60.00 HPA
Min: -22.235 Max: 76.335 Mean: 9.9942



STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN OBSERVATION [DU] (ALL)
DATA PERIOD = 2007060100 - 2007063018
EXP = 0001, LAYER = 16, 1.00 - 75.00 HPA
Min: 122.37 Max: 444.6 Mean: 225.01



STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN FIRST GUESS DEPARTURE (OBS-FG) [DU] (ALL)
DATA PERIOD = 2007060100 - 2007063018
EXP = 0001, LAYER = 16, 1.00 - 75.00 HPA
Min: -56.163 Max: 229.82 Mean: 19.616

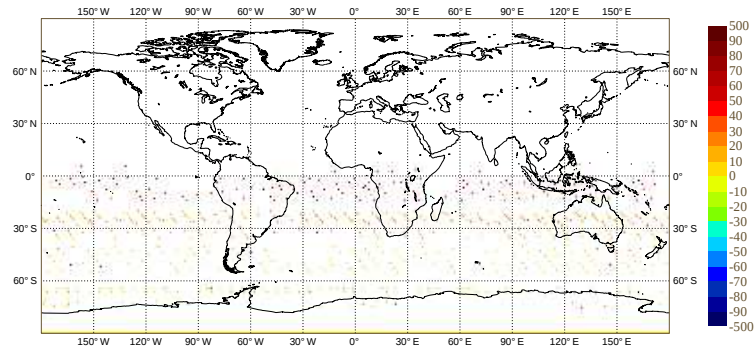


Fig. 22. As Fig. 21 but for layer 12 (40-60 hPa) and layer 16 (1-100 hPa).

REPORT ABOUT ENVISAT GOMOS NRT WATER VAPOUR DATA (GOM_RR_2P) FOR JUNE 2007

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Emails: Rossana.Dragani@ecmwf.int, Tel: 0044 118 9499259*

July 6, 2007

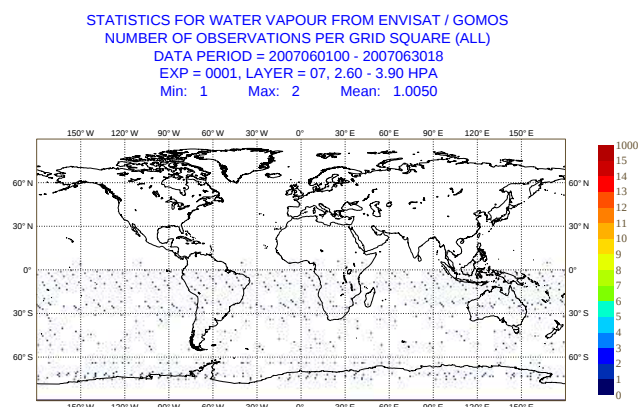


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT water vapour data for level 7 (2.6-3.9 hPa) for June 2007.

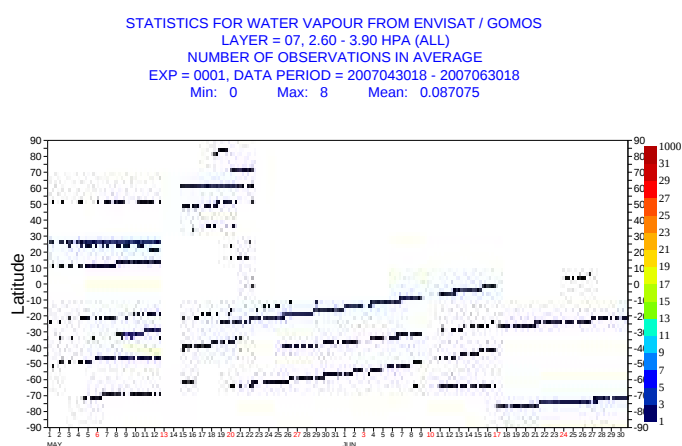


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT water vapour data per 6-hour cycle for level 7 (2.6-3.9 hPa) for May-June 2007.

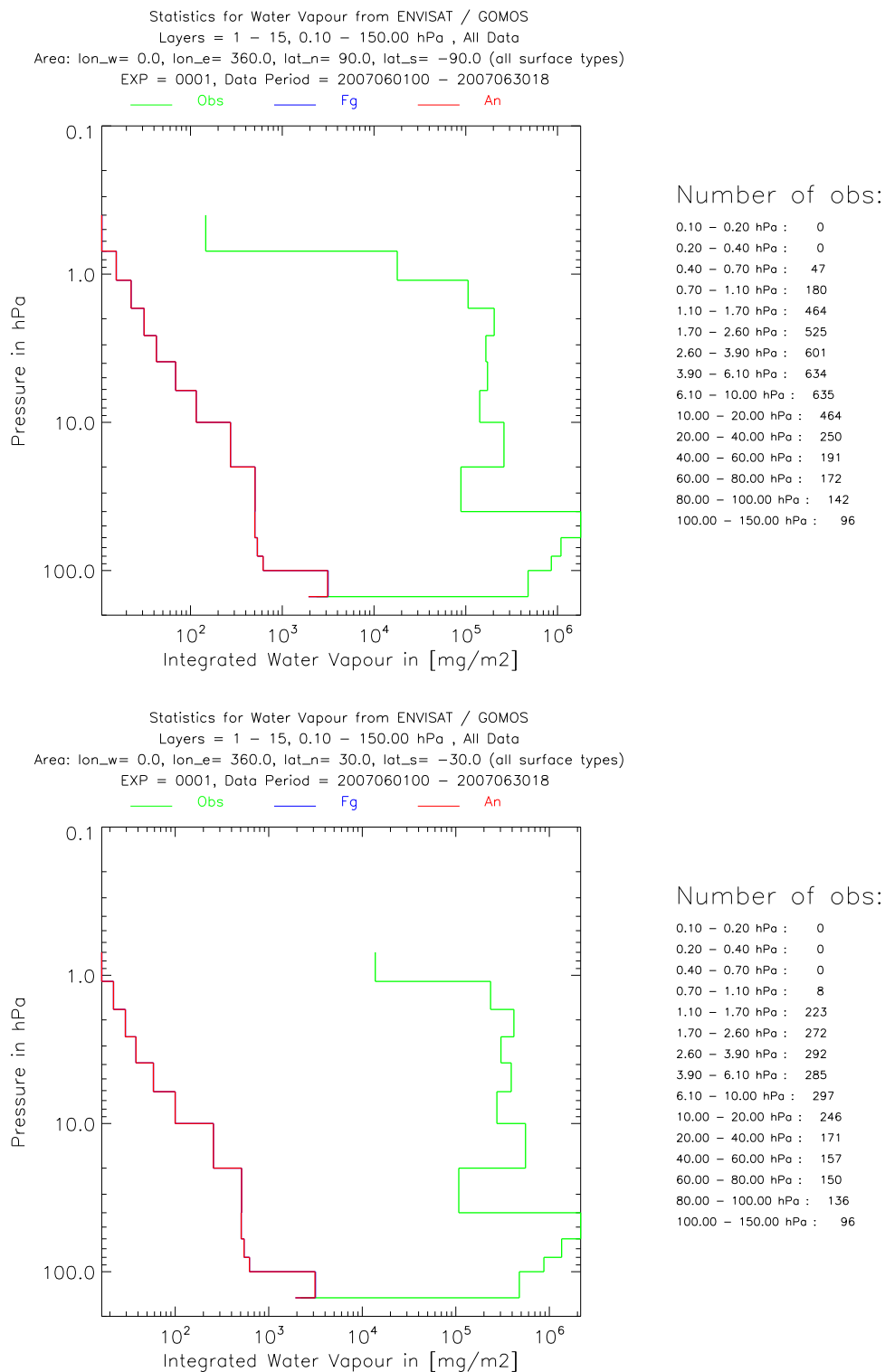


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT water vapour data in mg/m^2 for June 2007. The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (green) globally averaged. The bottom plot shows a similar plot for the tropical band (30N-30S). Plotted are the partial columns for the 16 levels listed to the right of the diagrams.

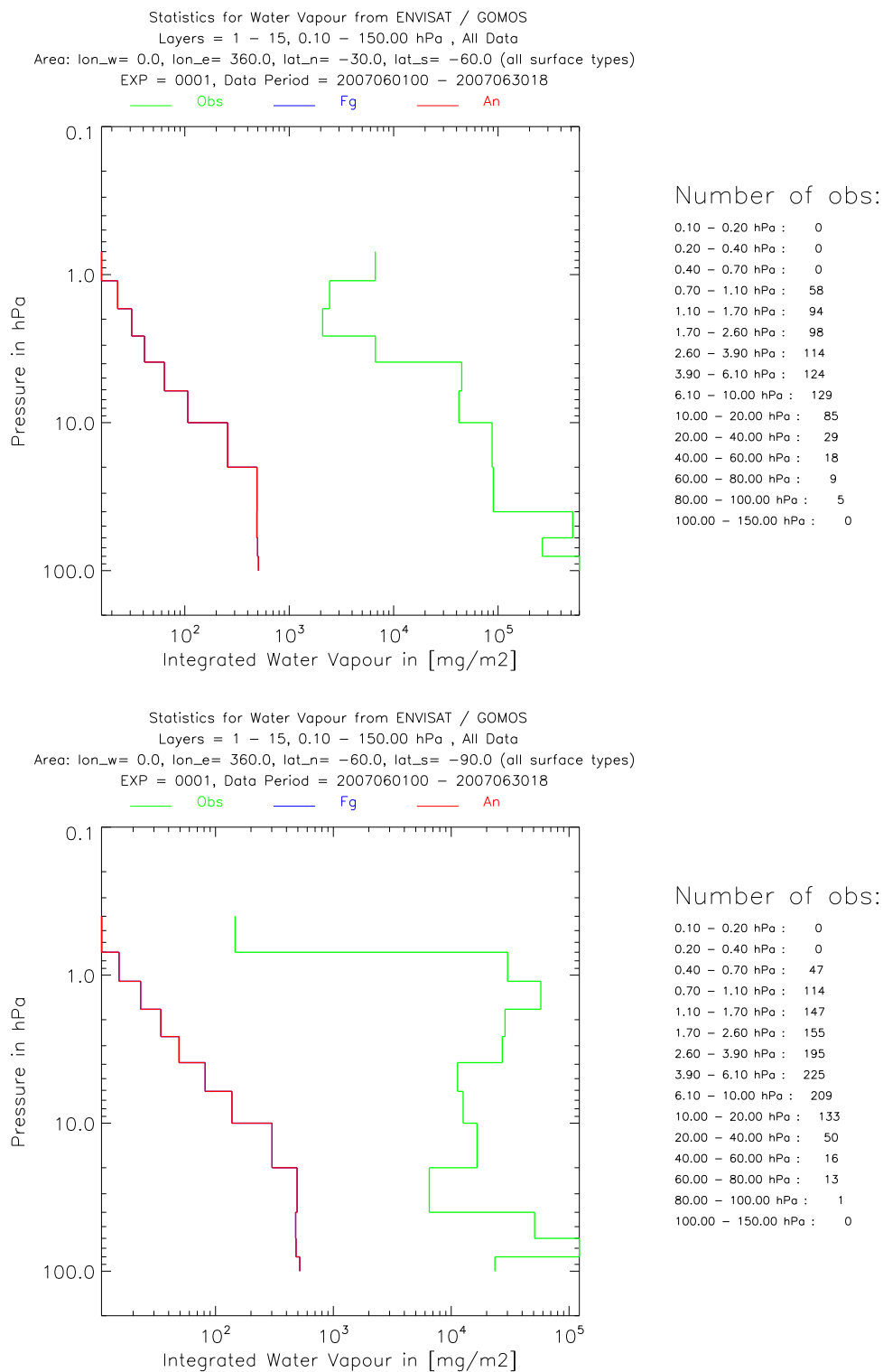


Fig. 4. As Fig. 3 but for 30-60S (top panel) and 60-90S (bottom panel).

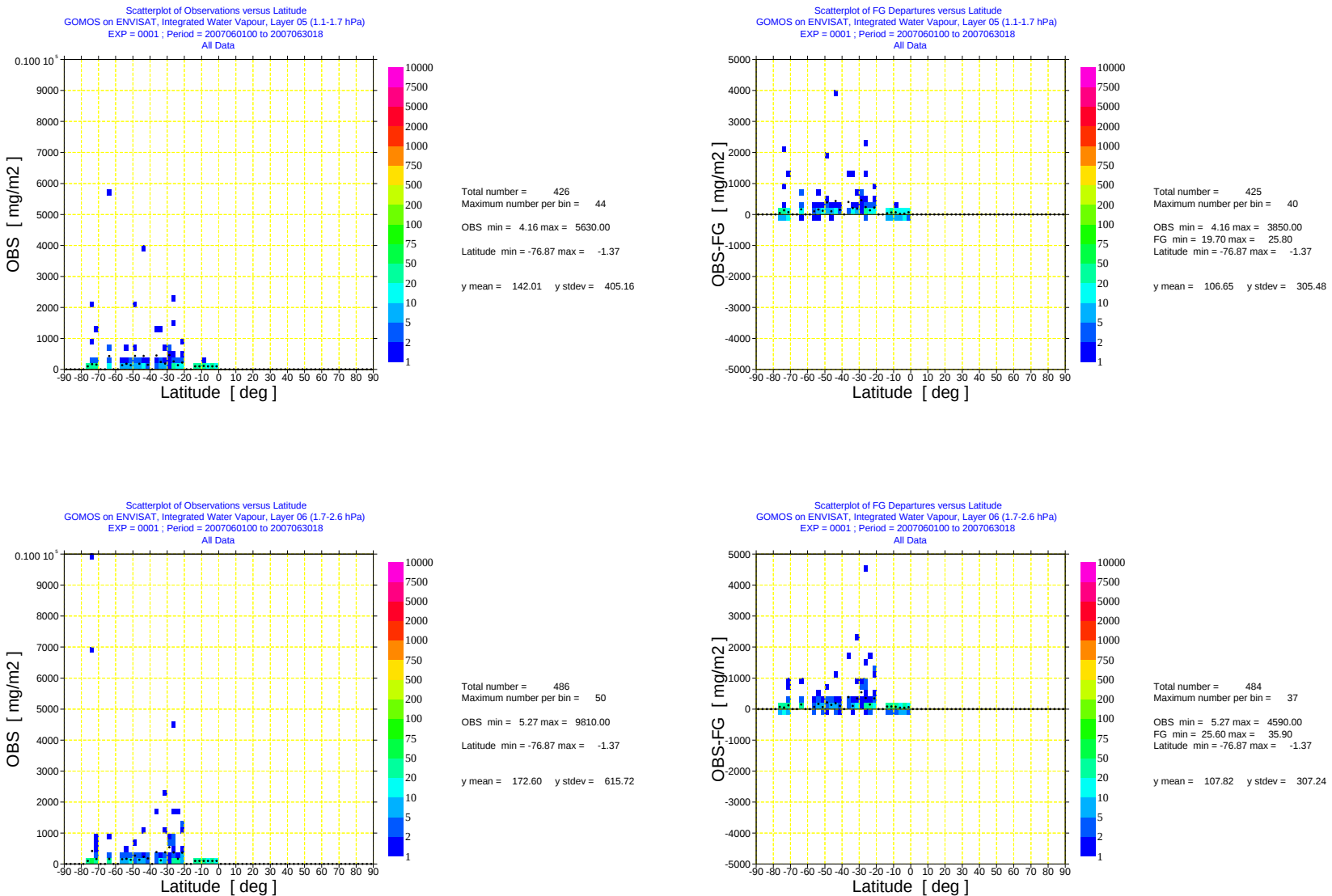


Fig. 5. Scatter plot of ENVISAT GOMOS NRT water vapour data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT water vapour data against latitude (right) for June 2007 for level 5 (1.1 hPa) and level 6 (1.7 hPa). The colours show the number of data per bin, and the black dots the mean value per bin.

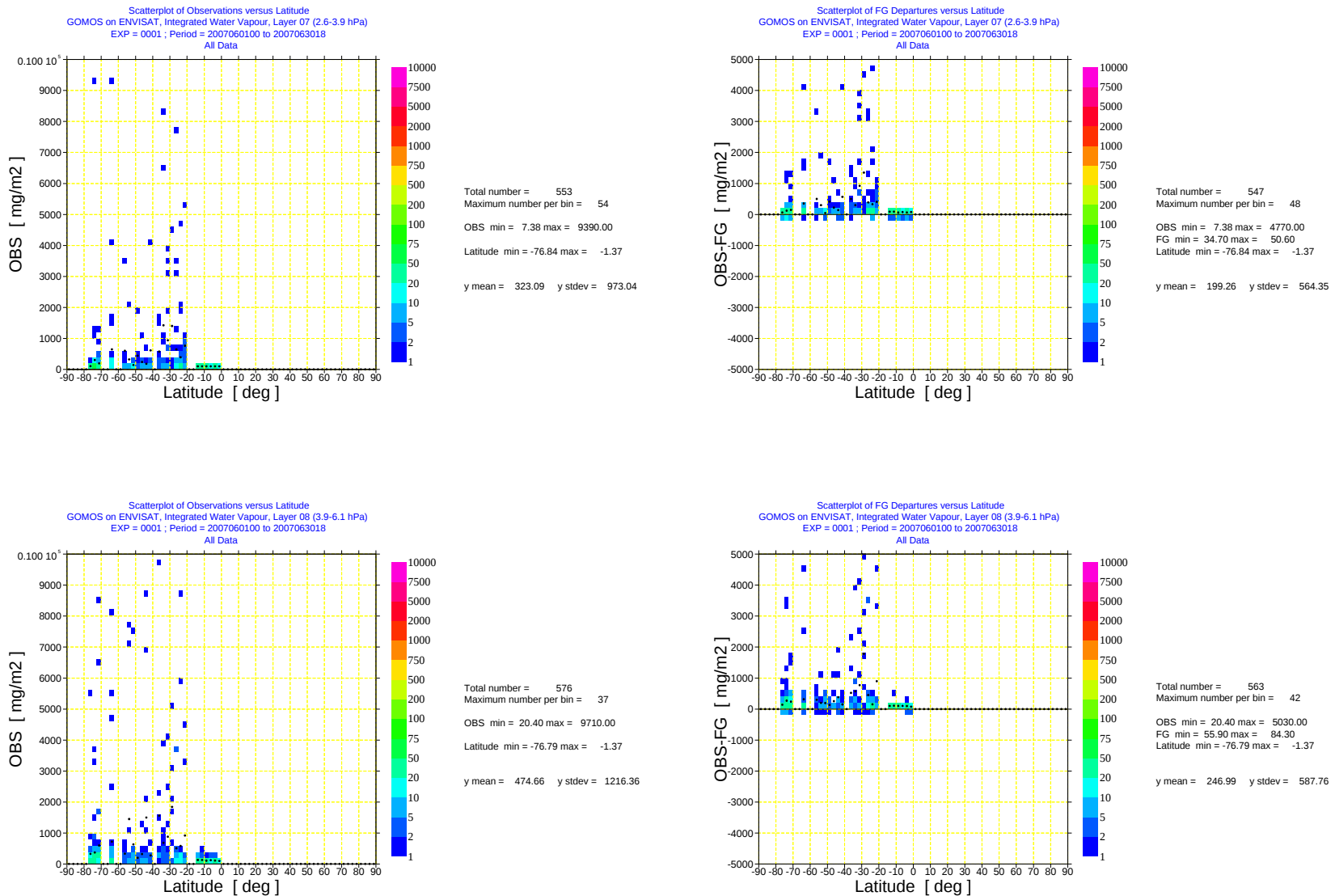


Fig. 6. As Fig. 5 but for level 7 (2.6 hPa) and level 8 (3.9 hPa).

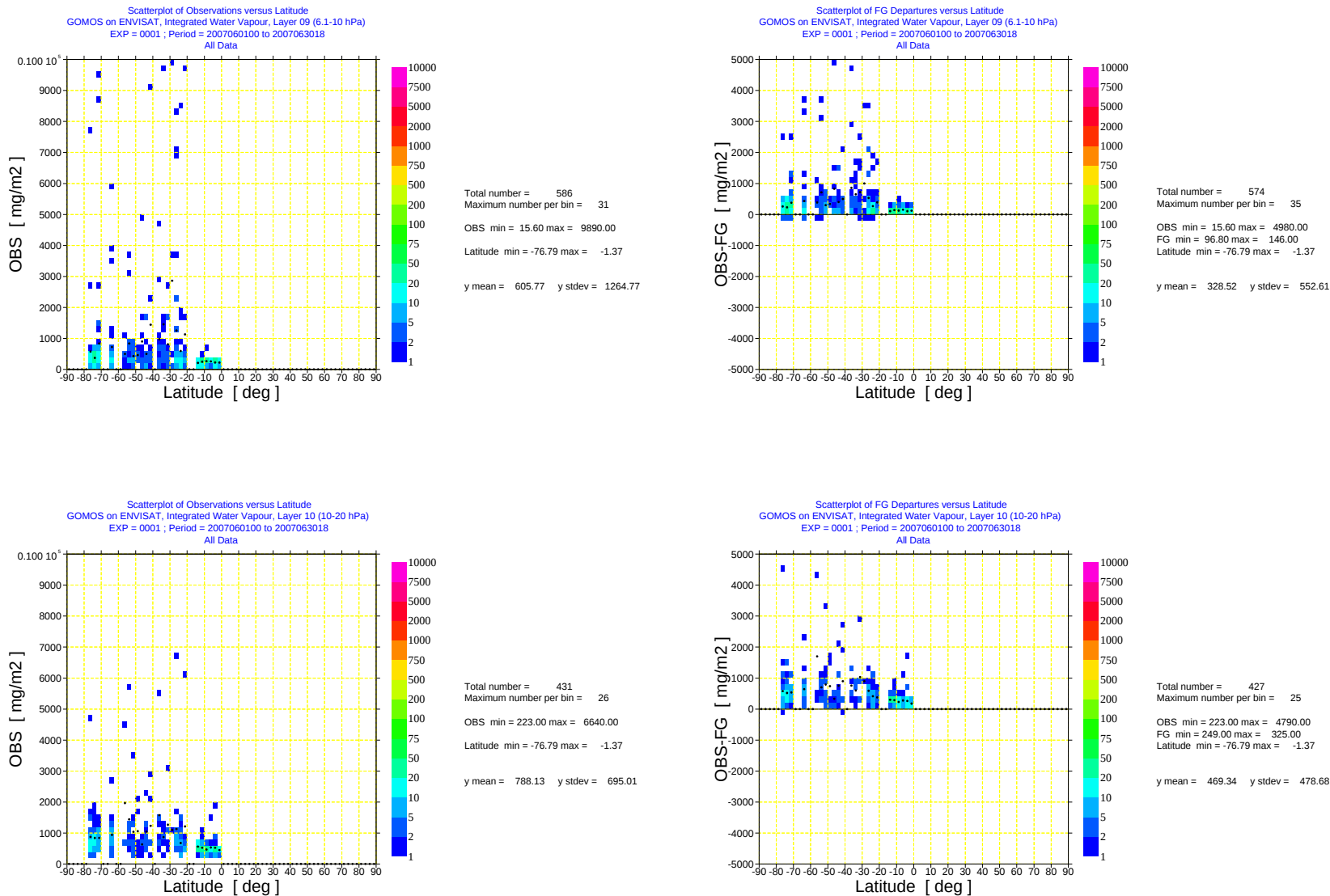


Fig. 7. As Fig. 5 but for level 9 (6.1 hPa) and level 10 (10 hPa).

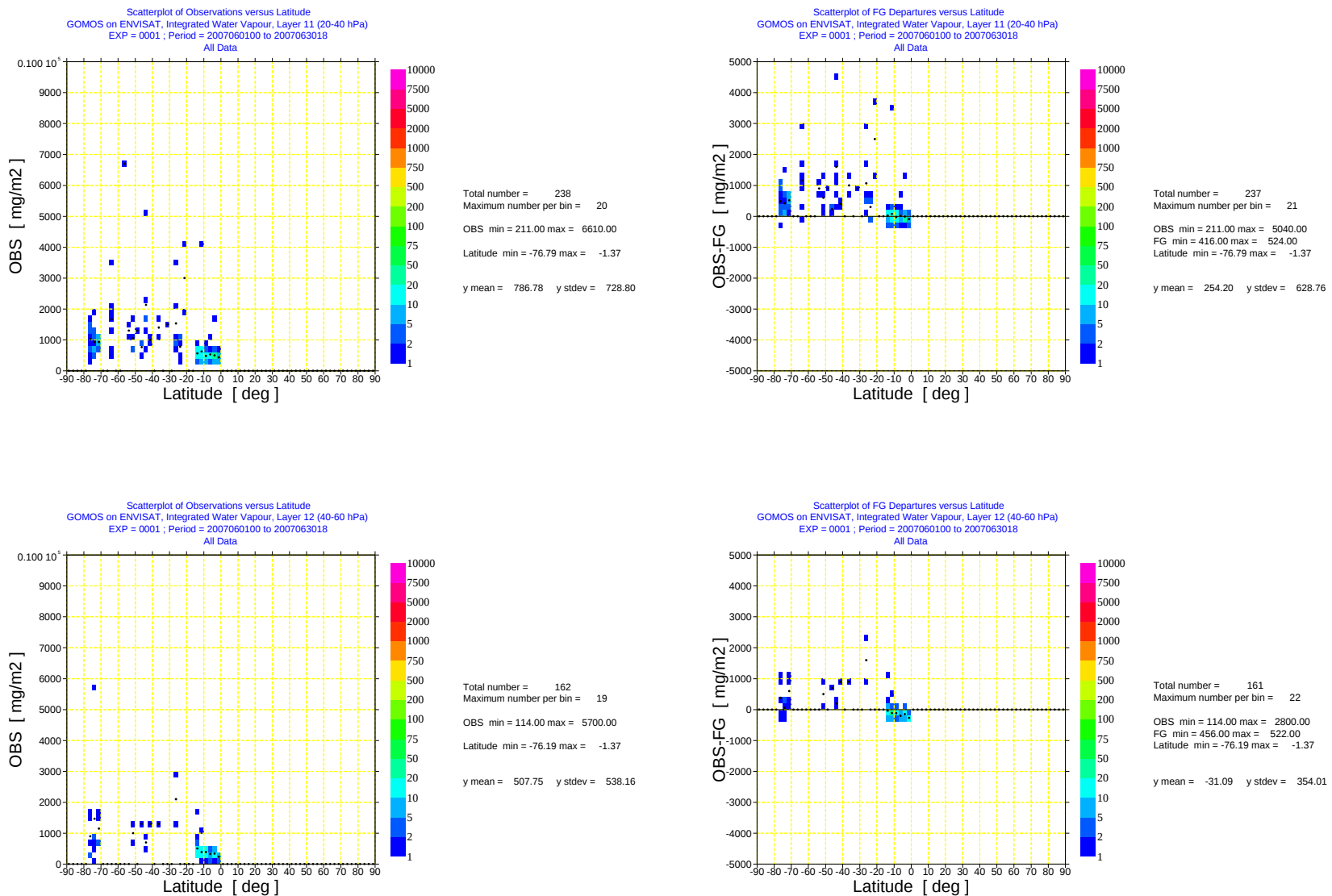


Fig. 8. As Fig. 5 but for level 11 (20-40 hPa) and level 12 (40-60 hPa).

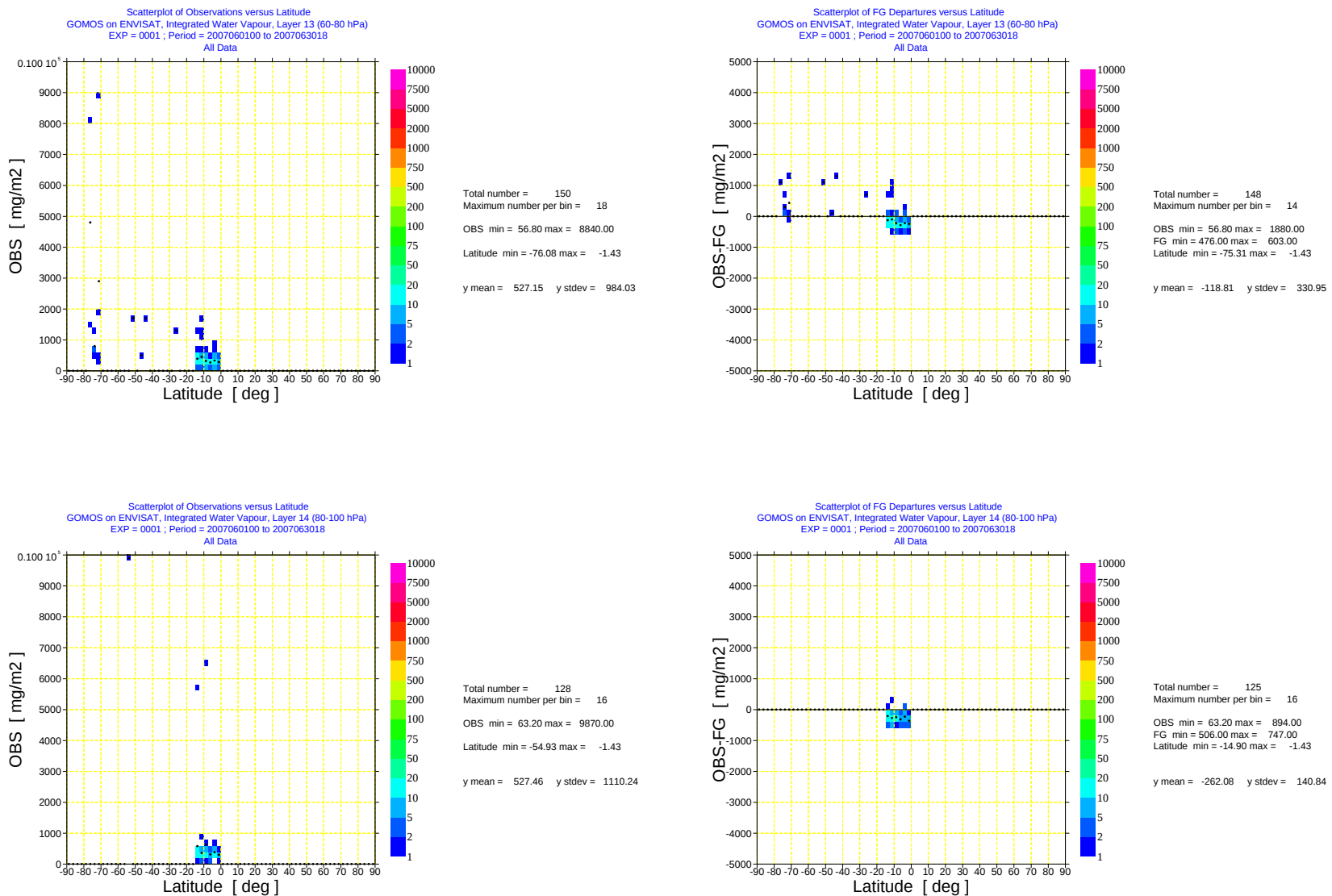


Fig. 9. As Fig. 5 but for level 13 (60-80 hPa) and level 14 (80-100 hPa).

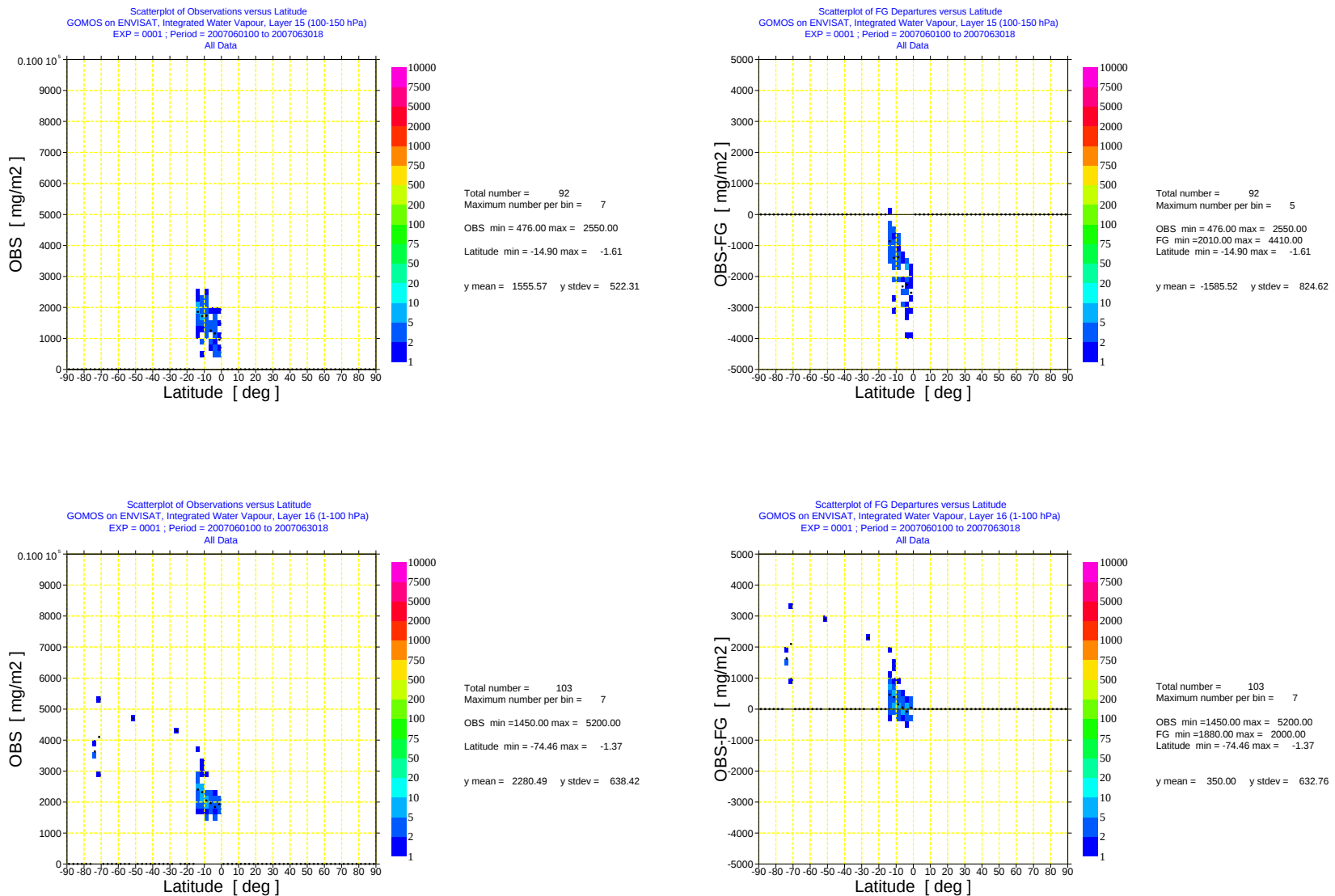


Fig. 10. As Fig. 5 but for level 15 (100-150 hPa) and level 16 (1-100 hPa).

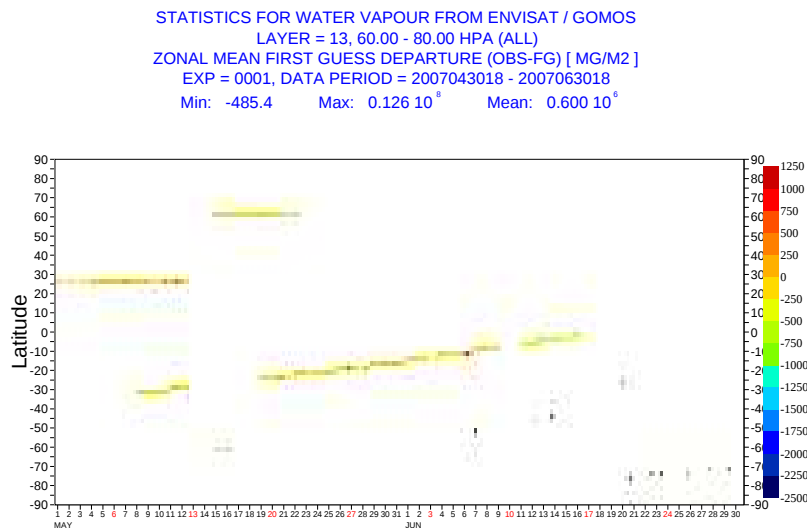
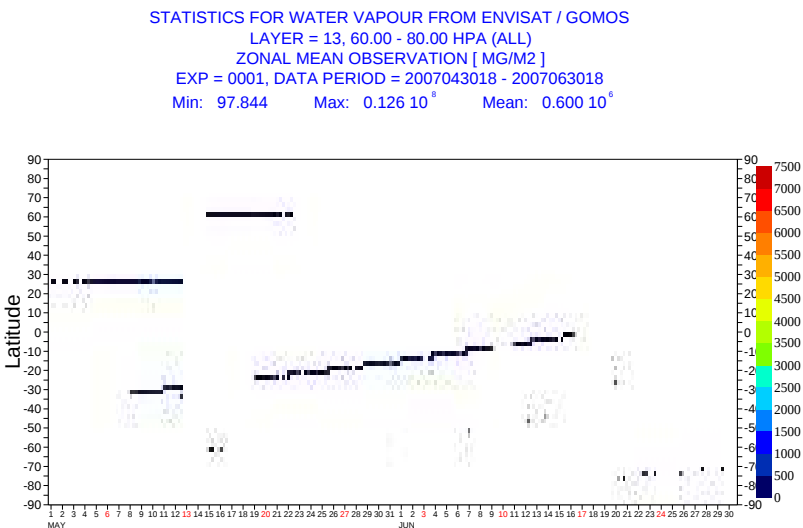
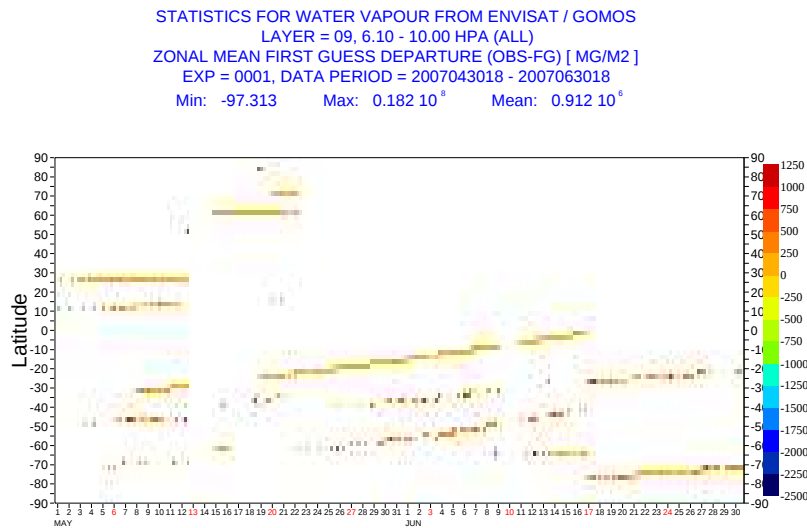
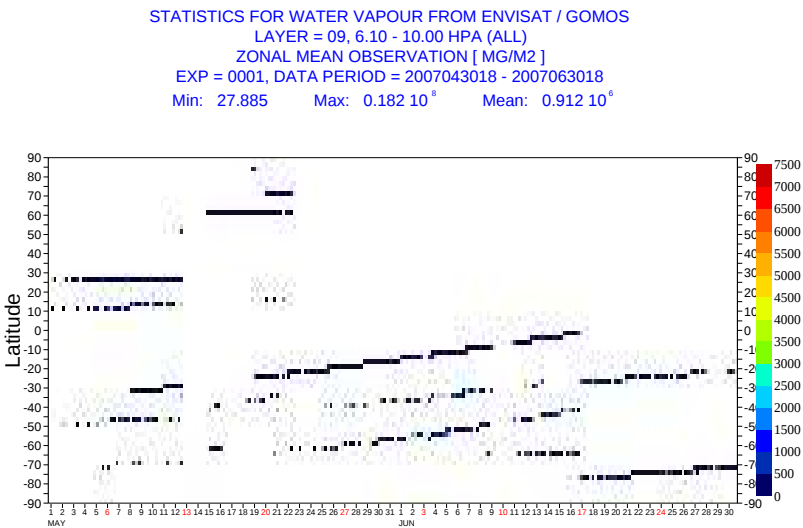


Fig. 11. Hovmöller diagram of zonal mean ENVISAT GOMOS NRT water vapour data per 6-hour cycle and of the zonal mean first-guess departures for level 13 (60-80 hPa) and level 15 (100-150 hPa) for May-June 2007.

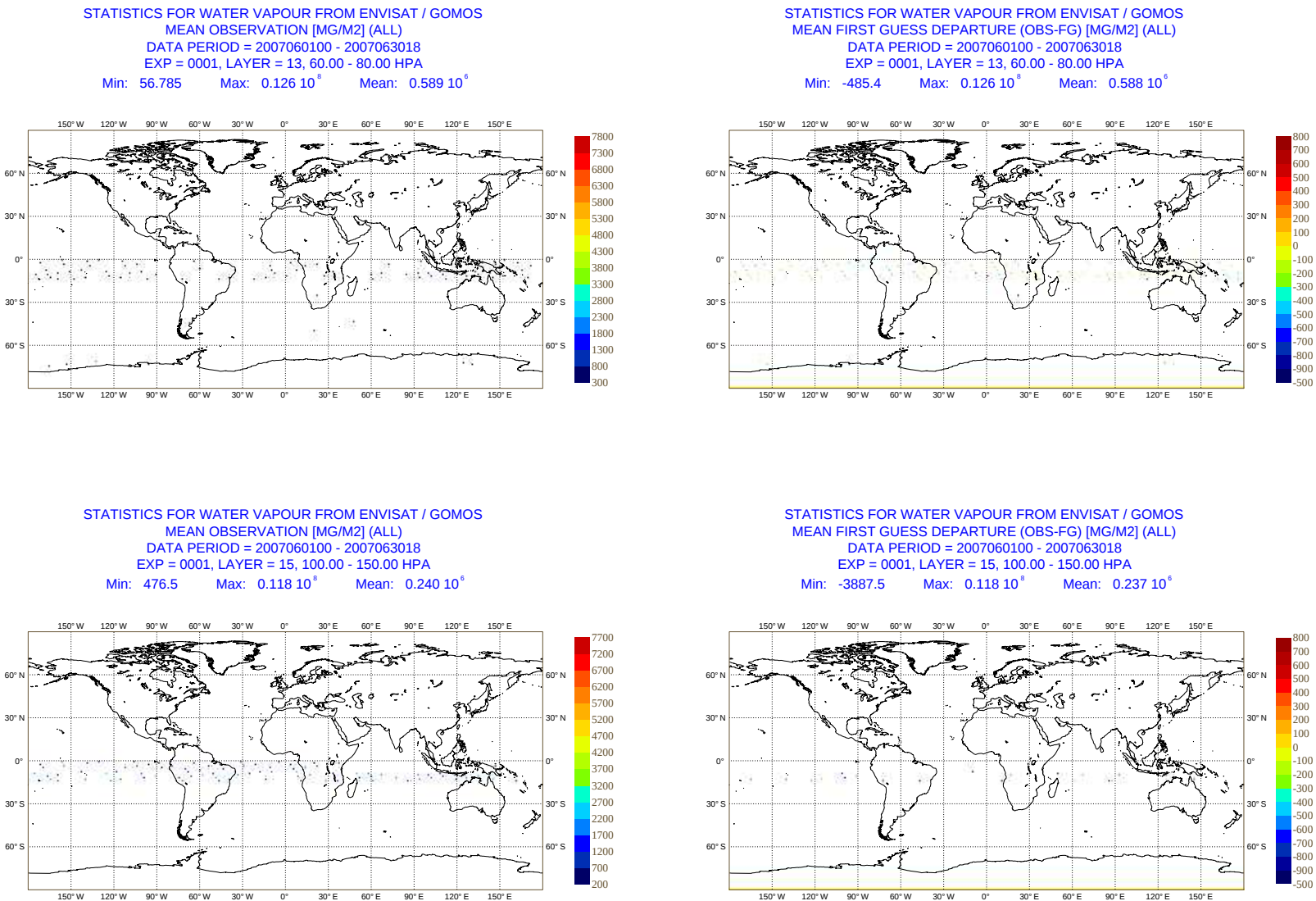


Fig. 12. Geographical distribution of mean ENVISAT GOMOS NRT water vapour data and mean first-guess departures for level 13 (60-80 hPa) and level 15 (100-150 hPa) for June 2007.

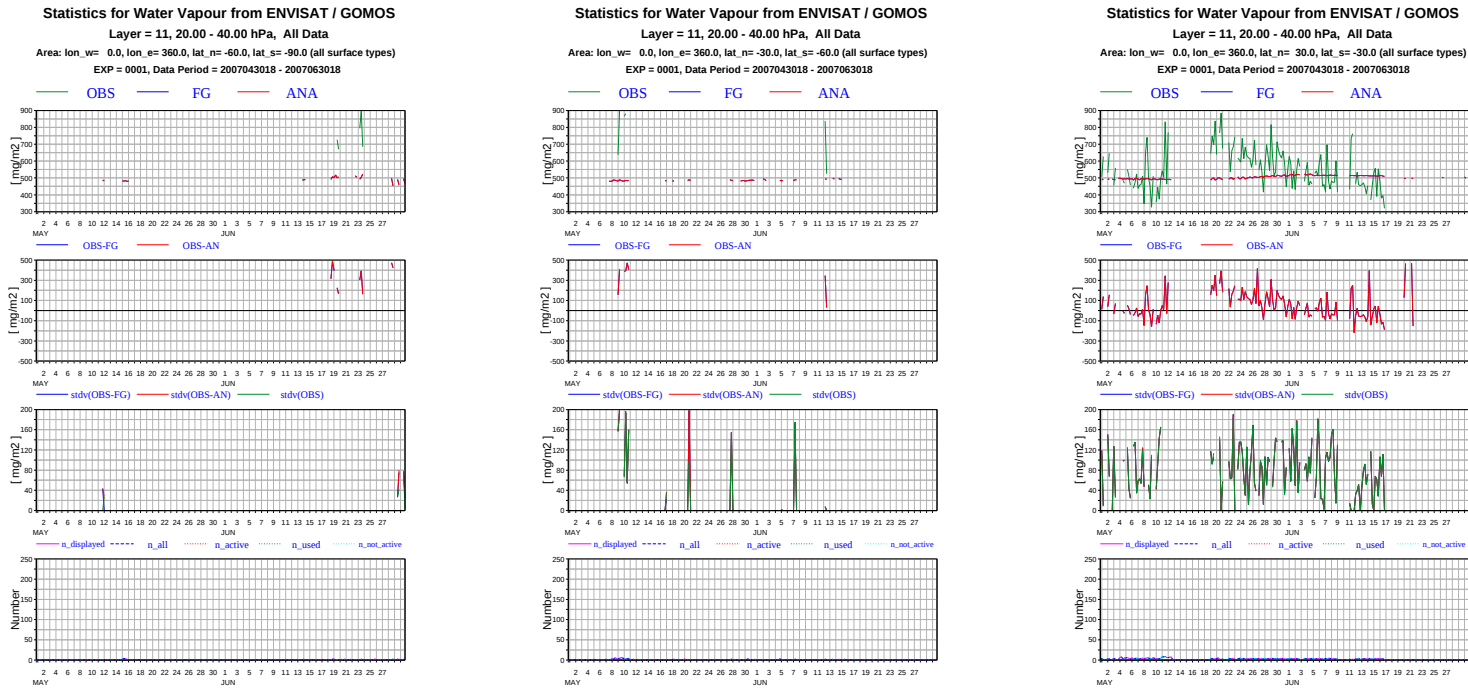


Fig. 13. Timeseries of mean ENVISAT GOMOS NRT water vapour data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for level 11 (20-40 hPa) 30N-30S, 30-60S, and 60-90S for the period May-June 2007.

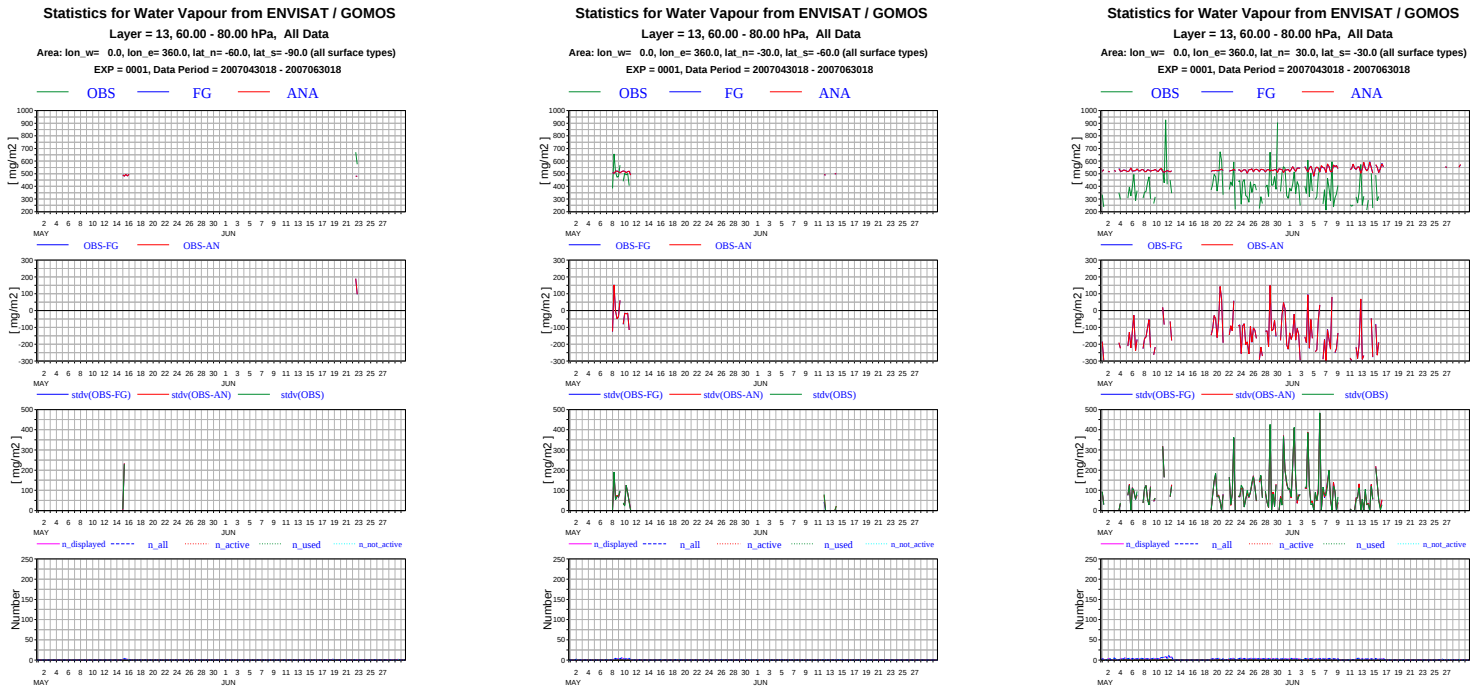


Fig. 14. As Figure 13, but for level 13 (60-80 hPa).

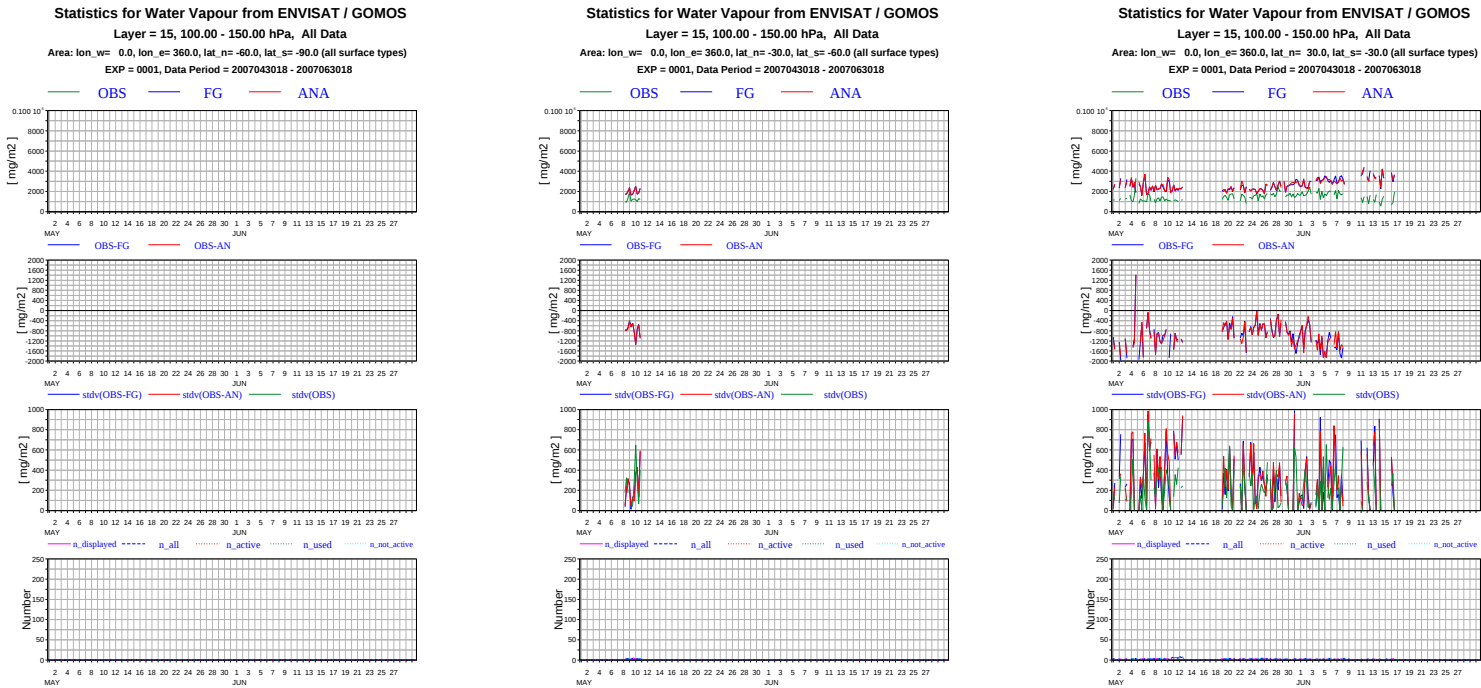


Fig. 15. As Figure 13, but for level 15 (100-150 hPa).