

REPORT ABOUT ENVISAT GOMOS NRT PRODUCTS (GOM_RR_2P) FOR JUNE 2009

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July 8, 2009

1. Key points for June 2009

- Instrumental problems, affecting the instrument since January 2009, have limited the amount of observations measured by GOMOS, particularly at stratospheric levels. In June 2009, hardly any data were available in the whole stratosphere, and when available most of the them were sampled in the equatorial band limited by the tropics. As a consequence, the monitoring statistics results, presented in this report, are in some cases not statistically significant.
- When available, the tropical temperature first-guess and analysis departures are generally negative up to -1% (-2K) in the stratosphere. In the mesosphere, the mean temperature departures are up to -3% (about -6K). The mean standard deviation of the first-guess and analysis departures were about 1% in the whole stratosphere and within 1 and 2% in the mesosphere.
- The tropical mean departures between the GOMOS ozone profiles and their model equivalent were within 7 and +15% in most of the mesosphere - the only region of the atmosphere where the number of observations was large enough to make the statistics significant -, although larger departures of about 35% were found between 0.1 and 0.2 hPa. In the stratosphere (for pressures lower than 40hPa), the first guess and analysis departures were generally within -10 and +15% when available. The standard deviations of the departures were larger than 10% at all levels.
- Based on the available data, 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, using the filter implemented in the PDS2BUFR converter. 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 available vertical levels and latitudes.
- The monitoring statistics for June were produced with the operational ECMWF model, CY35R2.

2. Quality and amount of received data

Data coverage and amount of received data during June 2009 are shown in figures 1 and 2 in the temperature, ozone and water vapour reports. Since January 2009, instrumental problems have limited the amount of data measured by the GOMOS instrument, particularly at stratospheric levels. In June 2009, hardly any data were available in the whole Stratosphere, and when available most of the them were sampled in the equatorial band limited by the tropics. Overall, about 900 (good) observations were available for temperature, just over 500 (good) observations were available for ozone, and about 20 for water vapour. The low amount of observations currently available in most regions of the atmopshere makes some of the results presented in this report hardly statistically significant. These results are nonetheless summarized below for completeness.

3. GOMOS temperature data

In June 2009, only about 20 observations were available per layer at stratospheric levels, and they were mainly sampled in the equatorial band limited by the tropics. Here, the tropical first-guess and analysis departures were generally negative up to -1% (-2K) in the stratosphere. In the mesosphere, the mean temperature departures are up to -3% (about -6K). The mean standard deviation of the first-guess and analysis departures were about 1% in the whole stratosphere and within 1 and 2% in the mesosphere. No data was available in the stratosphere in the extratropics. Departures up to -5% (about -10K) were found in the mesosphere at mid and high latitudes in the SH. The standard deviations of the departures were up to 3%.

The scatter plots (temperature report: Figures 6-9) 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 tropical 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 10, 13-14 of the temperature report, respectively. Both the Hovmoeller plots and the timeseries confirmed the results discussed above.

4. GOMOS ozone data

The profile plots (ozone report: Figures 3-5) showed that both the ozone first guess and analyses were within the observation one-standard deviation range. Most of the data were sampled in the tropics. In the mesosphere (the only region of the atmosphere where the number of observations was large enough to make the statistics significant), the first guess and analysis departures within 7 and +15%, and about 35% at the top. In the stratosphere (for pressures lower than 40hPa), the first guess and analysis departures were generally within -10 and +15%. The standard deviations of the departures were larger than 10% at all levels.

The scatter plots (ozone report: Figures 6-9), the timeseries of GOMOS ozone and departures (ozone report: Figure 10) and the Hovmoeller plots (ozone report: Figure 11) confirm the level of agreement between NRT GOMOS ozone retrievals and the ECMWF ozone analyses discussed above.

5. Water vapour data

The level of agreement between the GOMOS water vapour profiles and the corresponding ECMWF water vapour first guess and analyses was generally poor as already discussed in the last few months. 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, where the GOMOS observations exhibited on average values of four orders of magnitude larger than their model equivalent. However, the number of data available in June 2009, up to 20 observations per layer, was not statistically significant.

The scatter plots (water vapour report: Figure 5) 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 of GOMOS water vapour and departures showed that very little signal if nothing at all was detected as a consequence of the combination of extremely low number of data and their poor quality.

6. Remarks

This monitoring report was produced with the operational ECMWF model (CY35R2). Ozone layers from SBUV/2 on NOAA-17 and NOAA-18, and OMI total column ozone were actively assimilated.

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), 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 JUNE 2009

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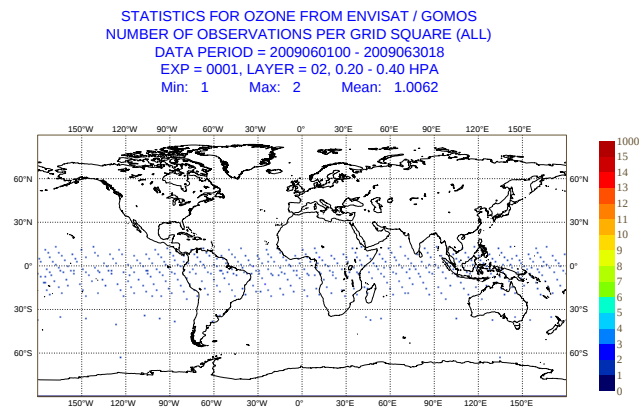


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT ozone data for layer 2 (0.2-0.4 hPa) for June 2009.

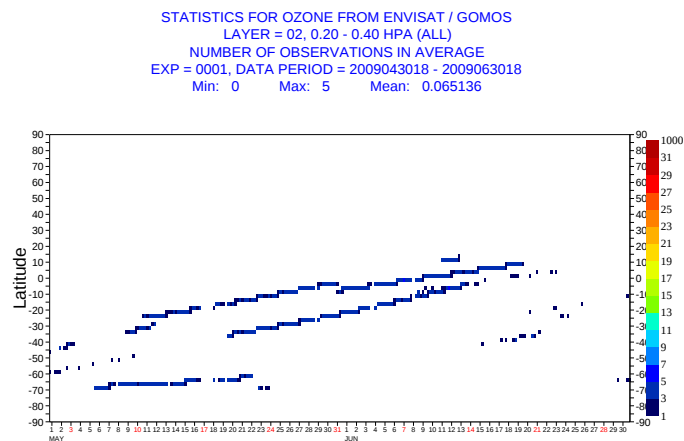


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT ozone data per 6-hour cycle for layer 2 (0.2-0.4 hPa) for May-June 2009.

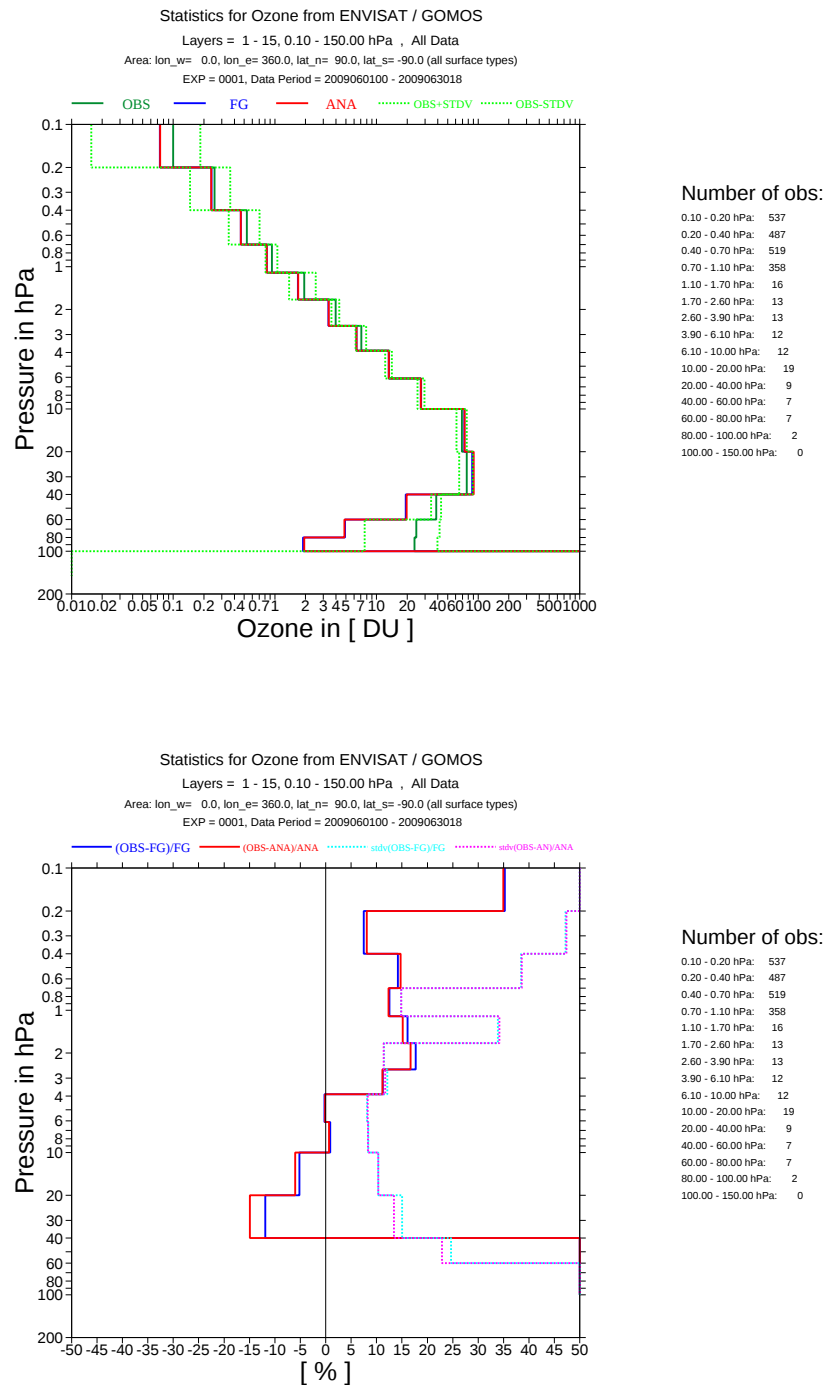


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT ozone data in DU for June 2009 (global mean). The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (red), and the mean observation (green) $\pm$ 1 standard deviation (green dotted lines). The 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.

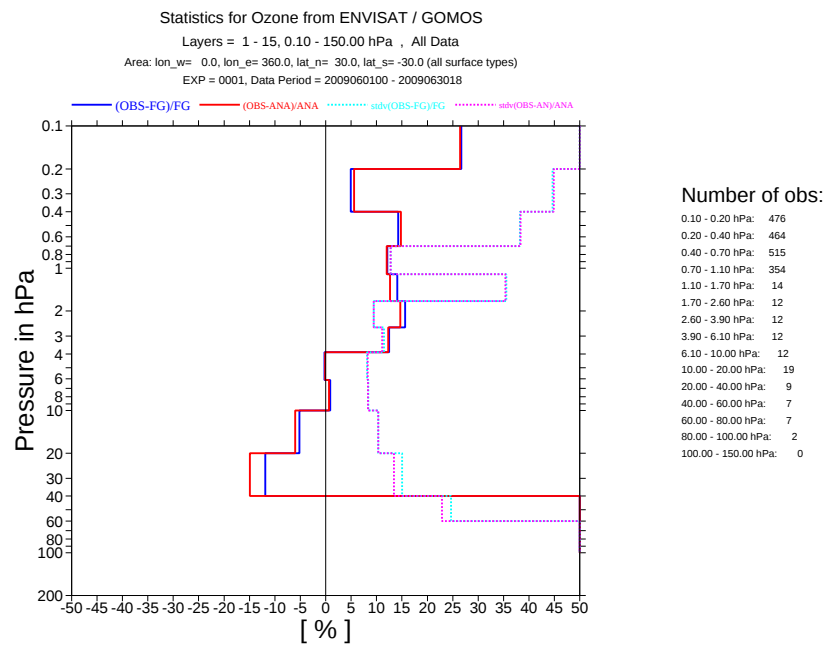
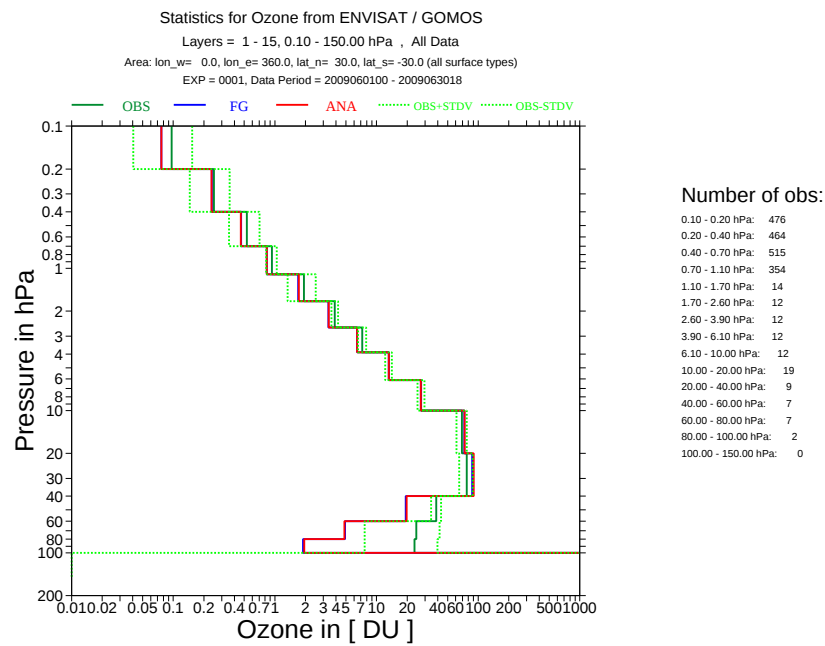


Fig. 4. As Fig. 3 but for 30N-30S.

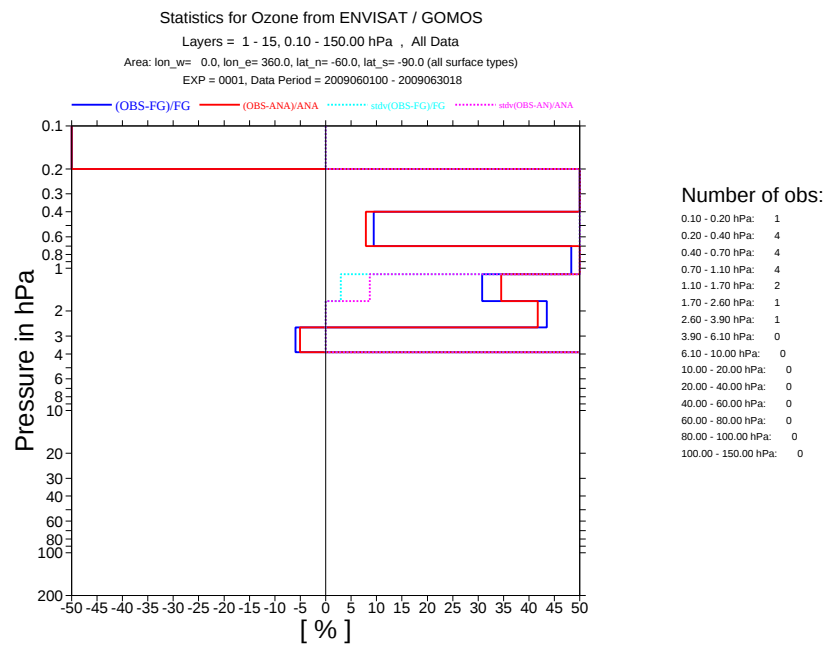
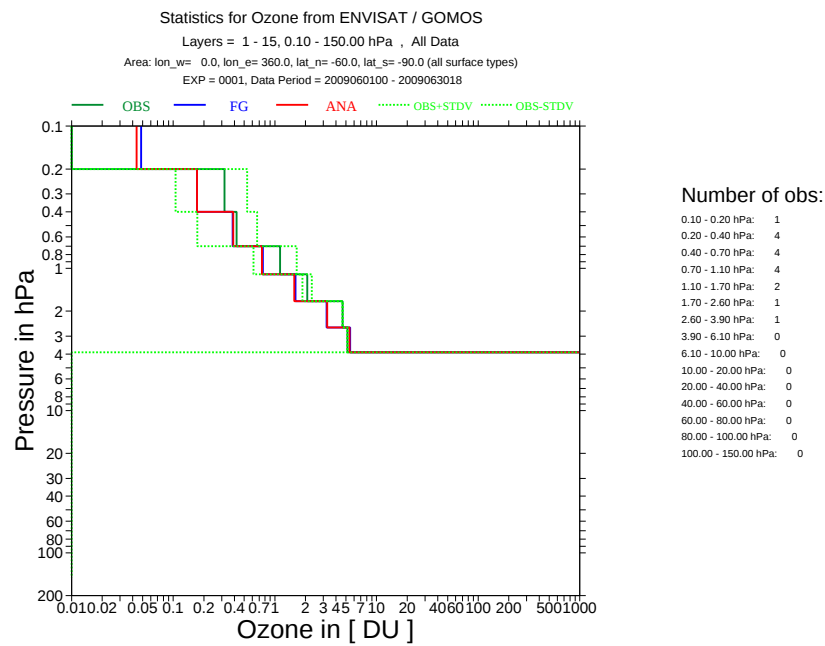


Fig. 5. As Fig. 3 but for 60-90S.

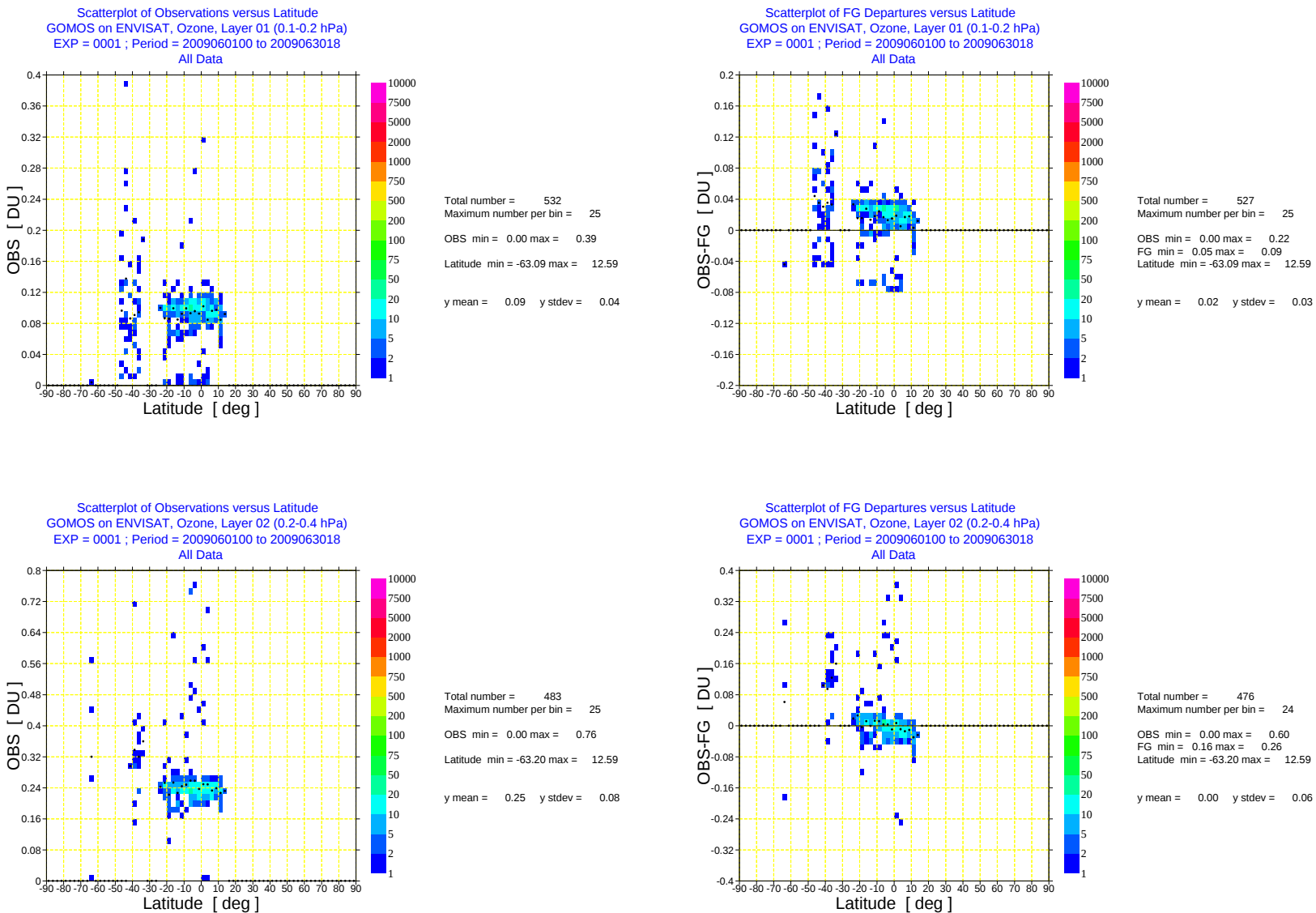


Fig. 6. Scatter plot of ENVISAT GOMOS NRT ozone data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT ozone data against latitude (right) for June 2009 for layer 1 (0.1-0.2 hPa) and layer 2 (0.2-0.4 hPa). The colours show the number of data per bin, the black dots the mean value per bin.

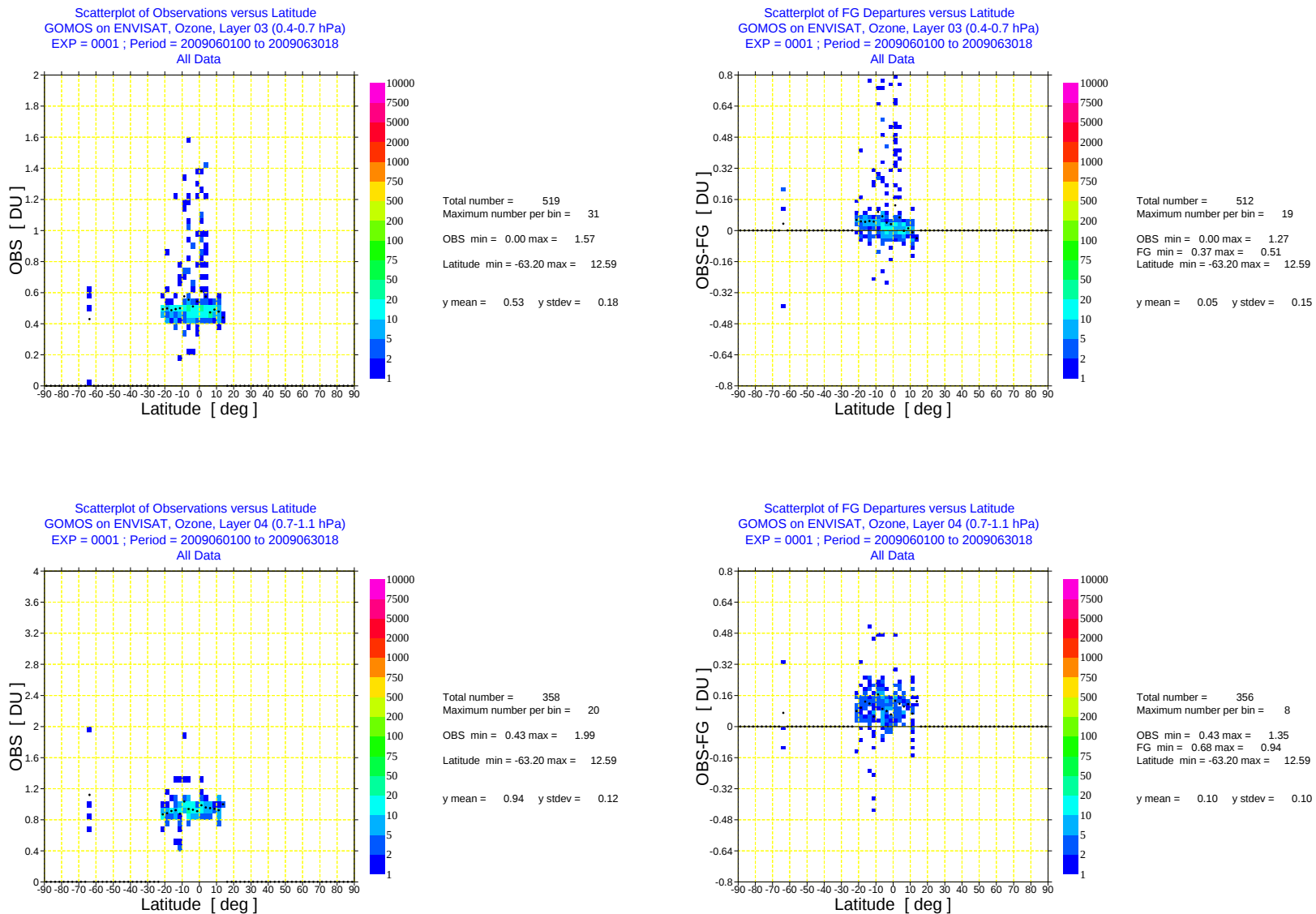


Fig. 7. As Fig. 6 but for layer 3 (0.4-0.7 hPa) and layer 4 (0.7-1.1 hPa).

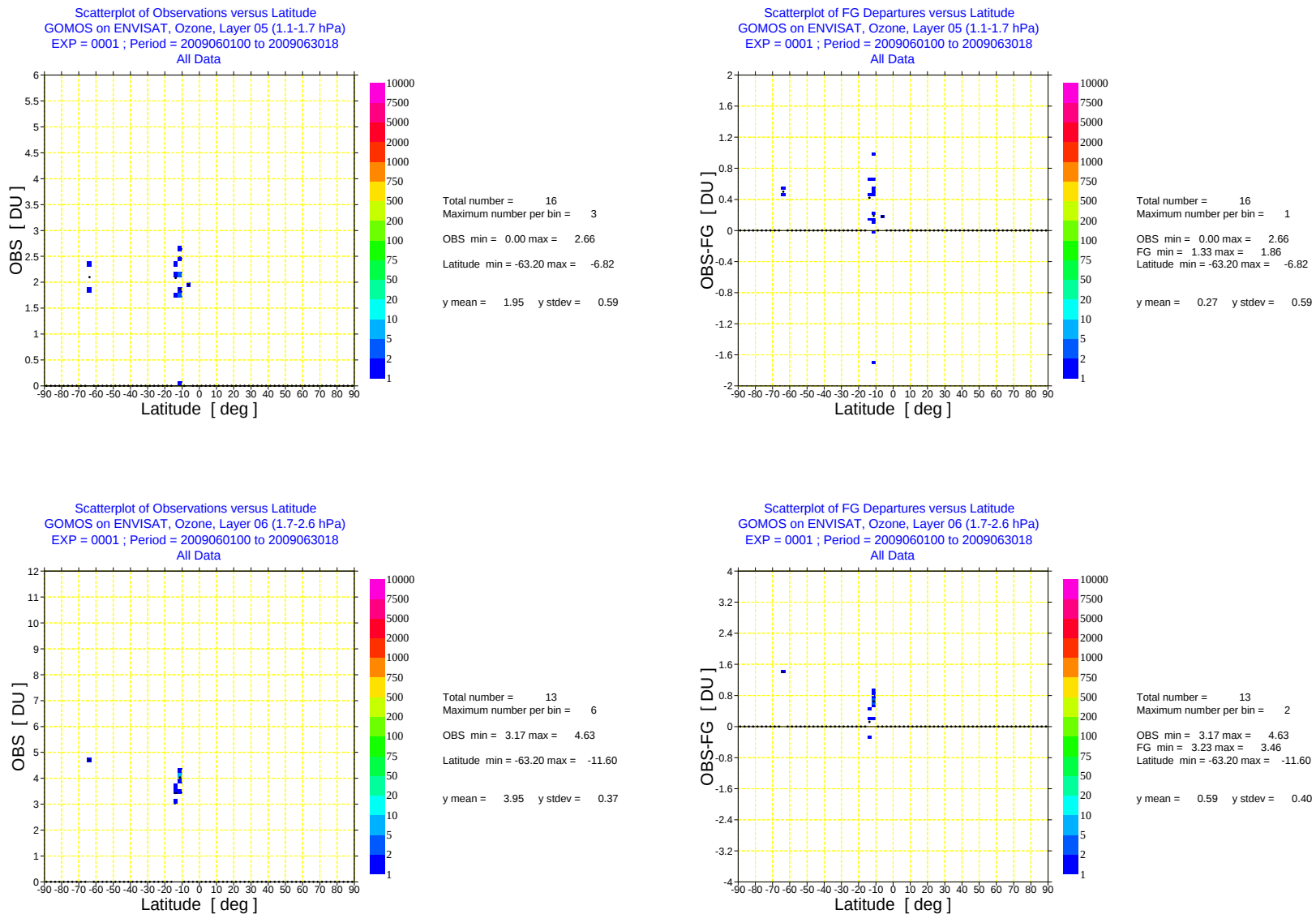


Fig. 8. As Fig. 6 but for layer 5 (1.1-1.7 hPa) and layer 6 (1.7-2.6 hPa).

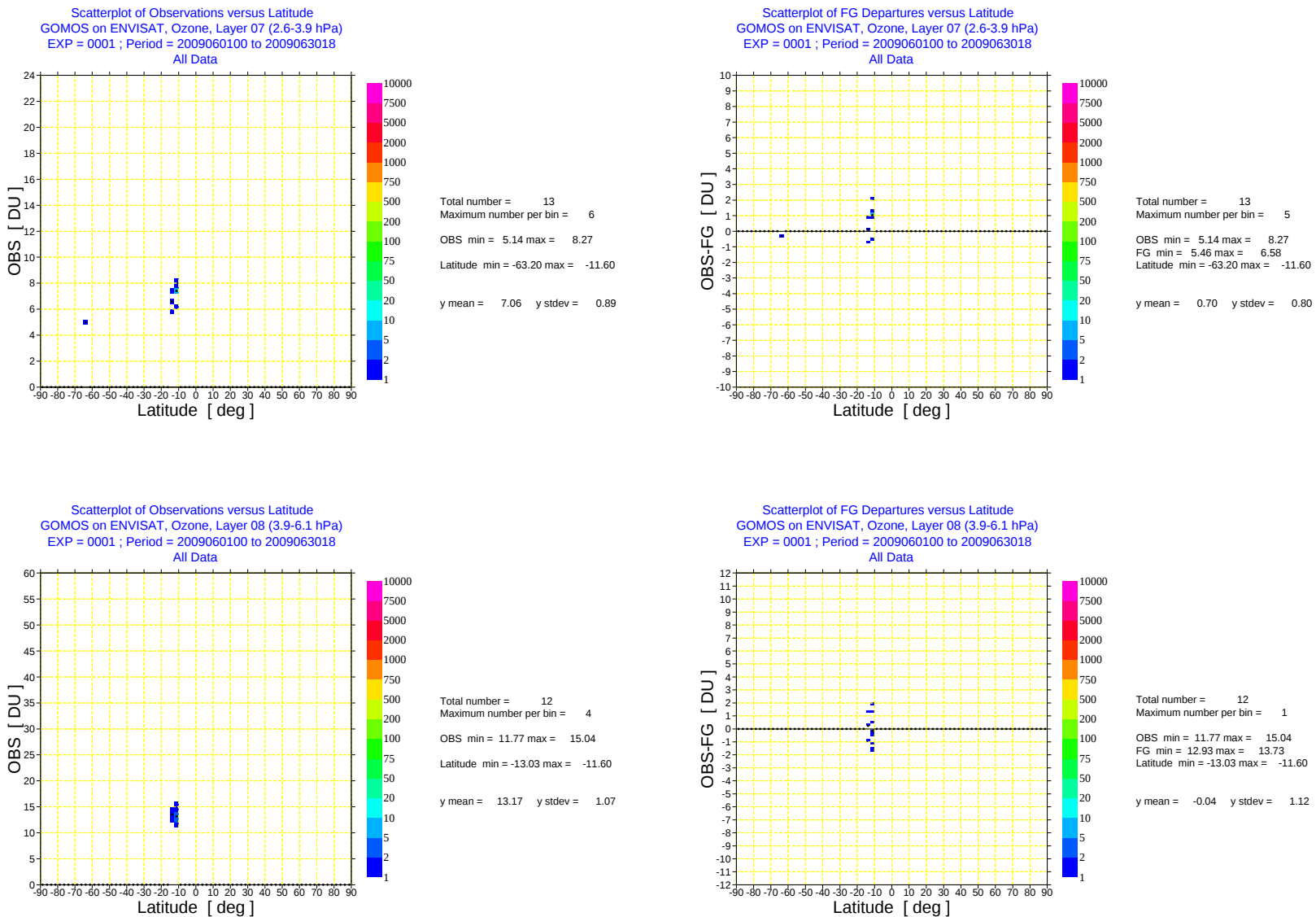


Fig. 9. As Fig. 6 but for layer 7 (2.6-3.9 hPa) and layer 8 (3.9-6.1 hPa).

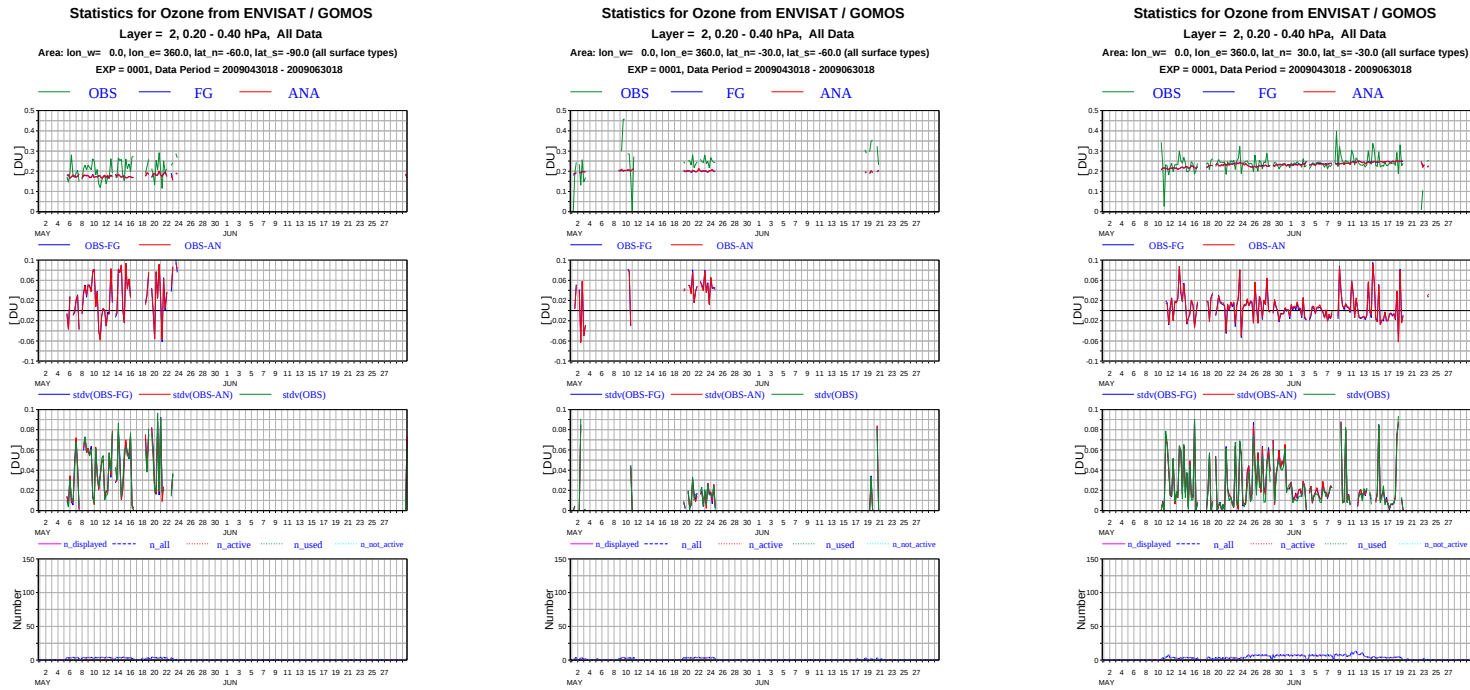


Fig. 10. Timeseries of mean ENVISAT GOMOS NRT ozone data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for layer 2 (0.2-0.4 hPa) 30N-30S, 30-60S, and 60-90S for the period May-June 2009.

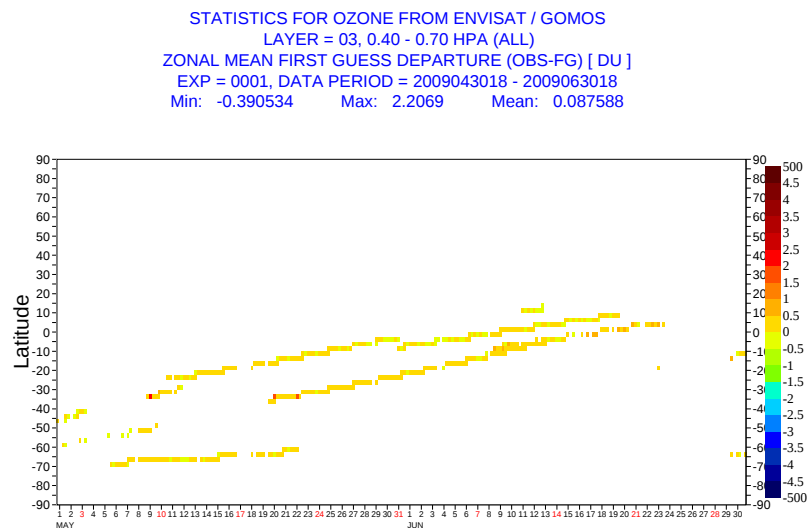
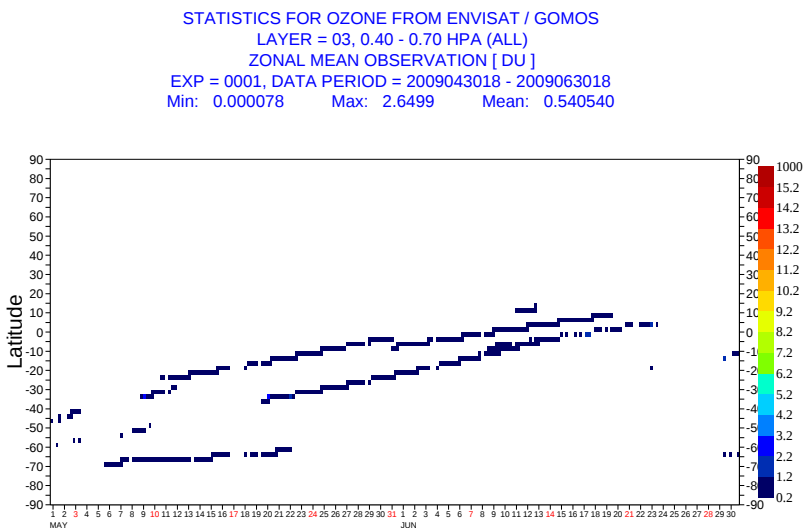
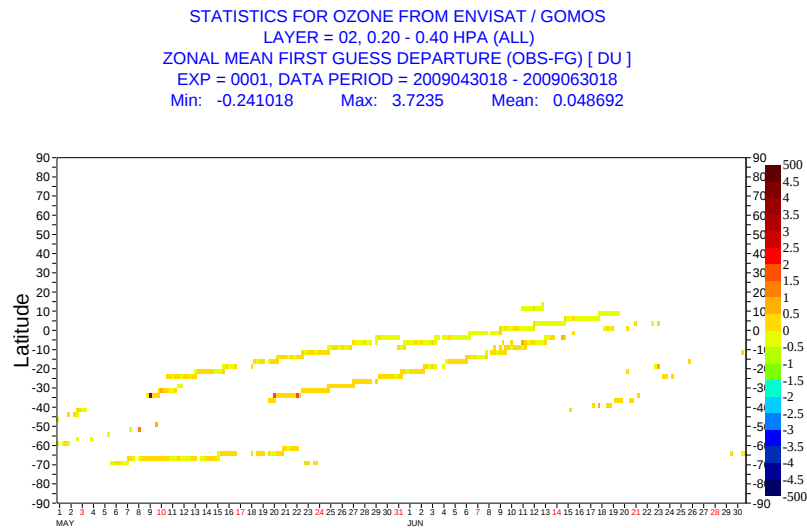
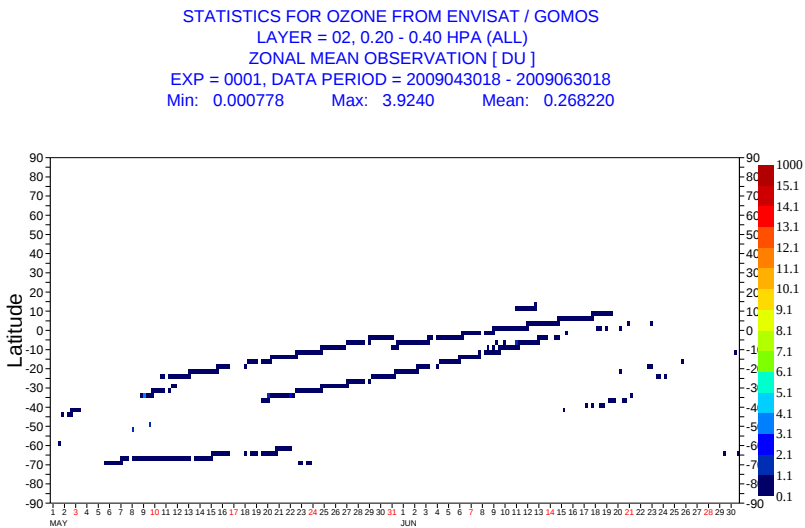


Fig. 11. Hovmöller diagram of zonal mean ENVISAT GOMOS NRT ozone data per 6-hour cycle for May-June 2009 and of the zonal mean first-guess departures for layer 2 (0.2-0.4 hPa) and layer 3 (0.4-0.7 hPa).

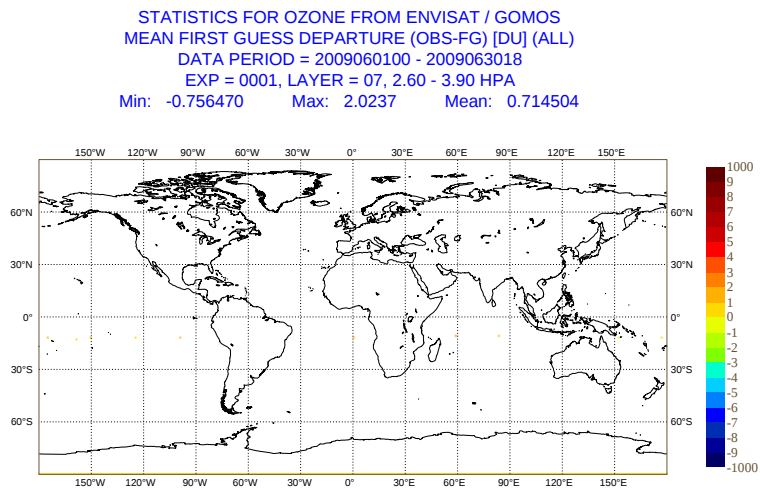
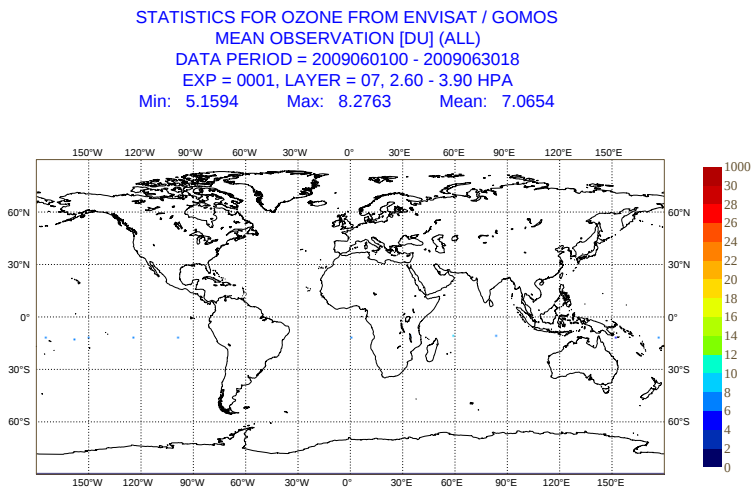
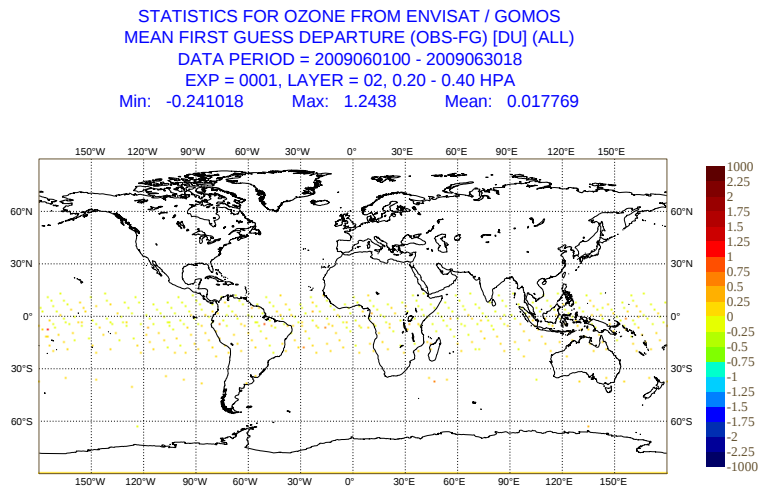
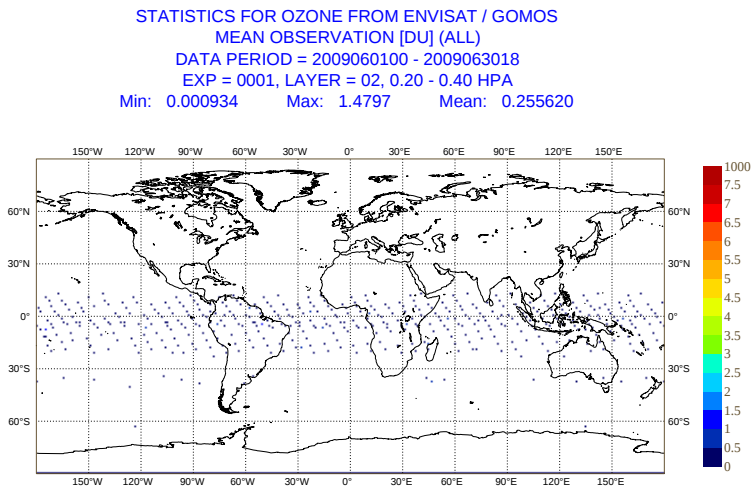
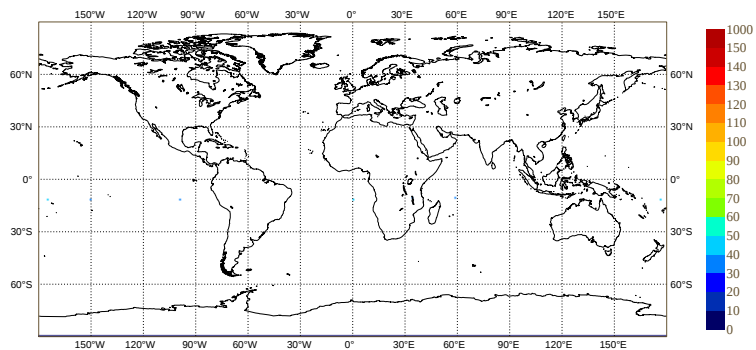
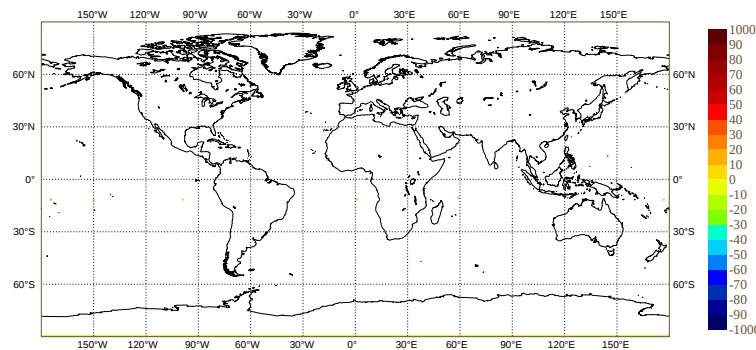


Fig. 12. Geographical distribution of mean ENVISAT GOMOS NRT ozone data and mean first-guess departures for June 2009 for layer 2 (0.2-0.4 hPa) and layer 7 (2.6-3.9 hPa).

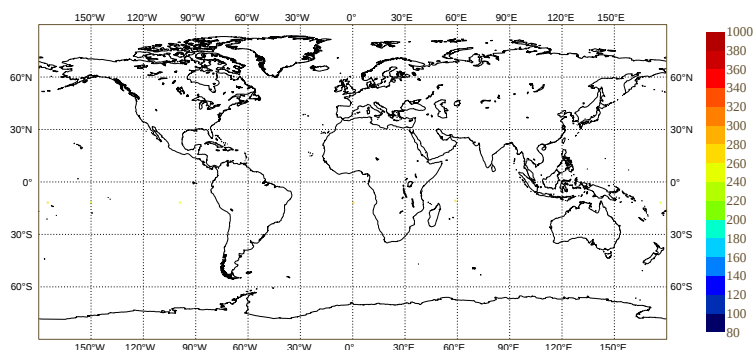
STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN OBSERVATION [DU] (ALL)
DATA PERIOD = 2009060100 - 2009063018
EXP = 0001, LAYER = 12, 40.00 - 60.00 HPA
Min: 32.123 Max: 44.696 Mean: 38.804



STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN FIRST GUESS DEPARTURE (OBS-FG) [DU] (ALL)
DATA PERIOD = 2009060100 - 2009063018
EXP = 0001, LAYER = 12, 40.00 - 60.00 HPA
Min: 12.111 Max: 28.274 Mean: 19.476



STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN OBSERVATION [DU] (ALL)
DATA PERIOD = 2009060100 - 2009063018
EXP = 0001, LAYER = 16, 1.00 - 75.00 HPA
Min: 250.92 Max: 270.72 Mean: 260.45



STATISTICS FOR OZONE FROM ENVISAT / GOMOS
MEAN FIRST GUESS DEPARTURE (OBS-FG) [DU] (ALL)
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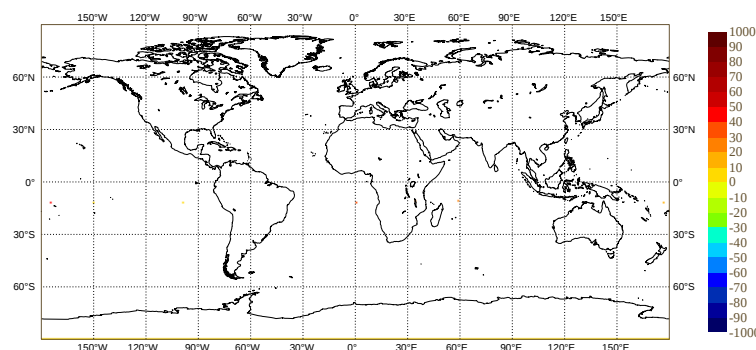


Fig. 13. As Fig. 12 but for layer 12 (40-60 hPa) and layer 16 (1-100 hPa).

REPORT ABOUT ENVISAT GOMOS NRT TEMPERATURE DATA (GOM_RR_2P) FOR JUNE 2009

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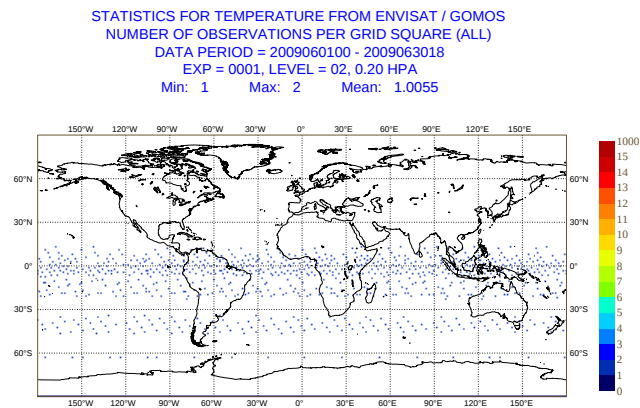


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT temperature data for level 2 (0.2 hPa) for June 2009.

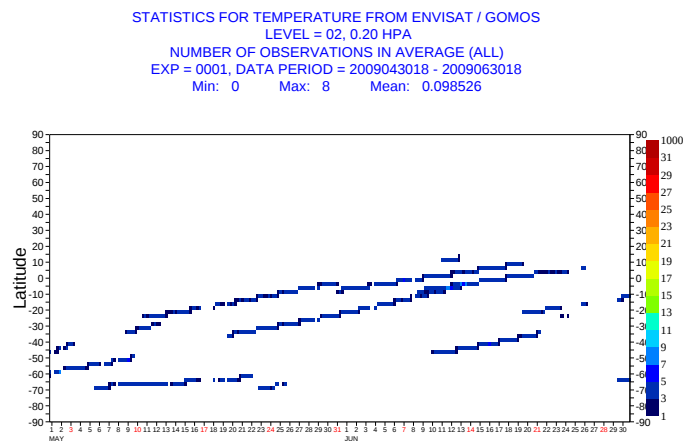


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT temperature data per 6-hour cycle for level 2 (0.2 hPa) for May-June 2009.

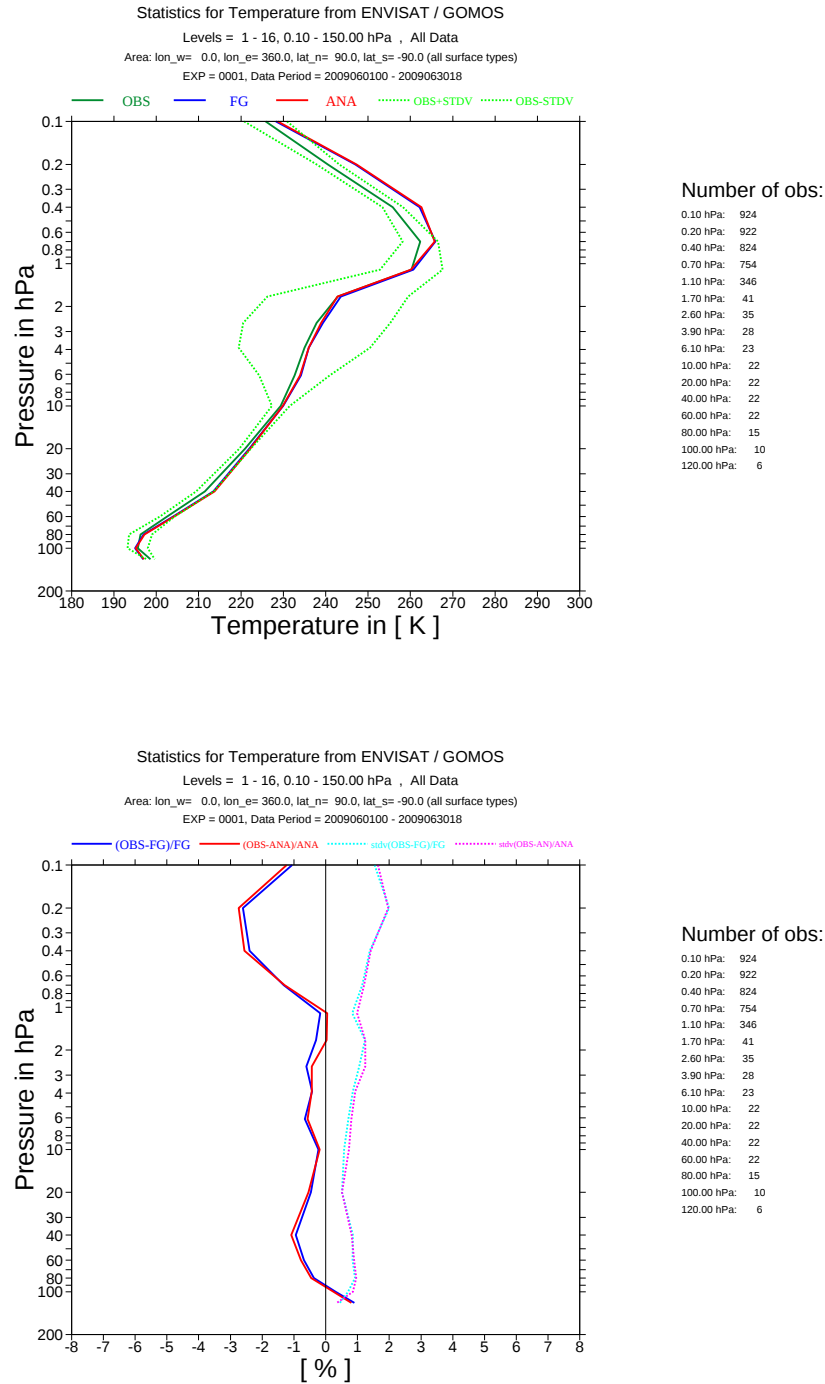


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT temperature data in K for June 2009 (global mean). The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (green), and the mean observation ± 1 standard deviation (green dotted lines). The bottom 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.

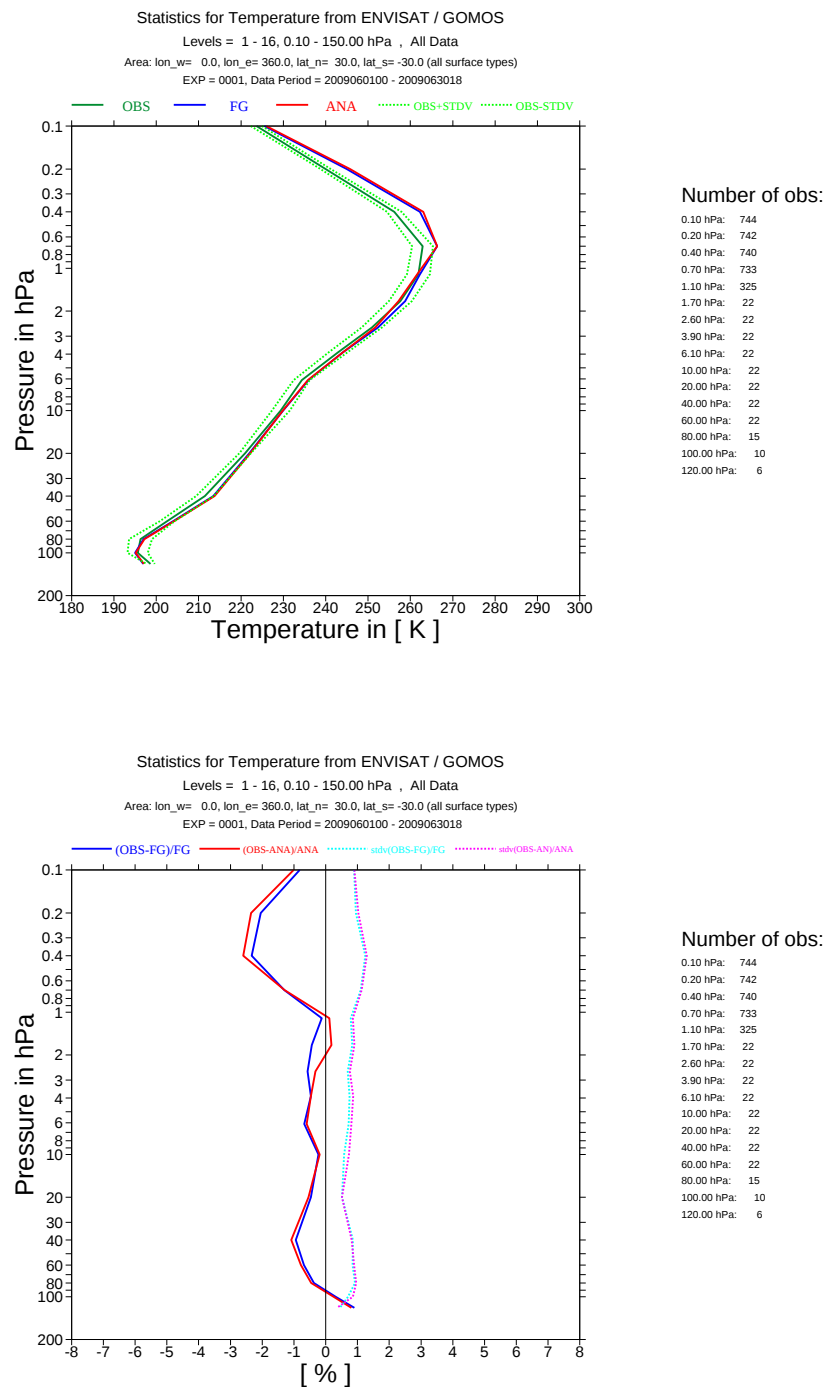


Fig. 4. As Fig. 3 but for 30N-30S.

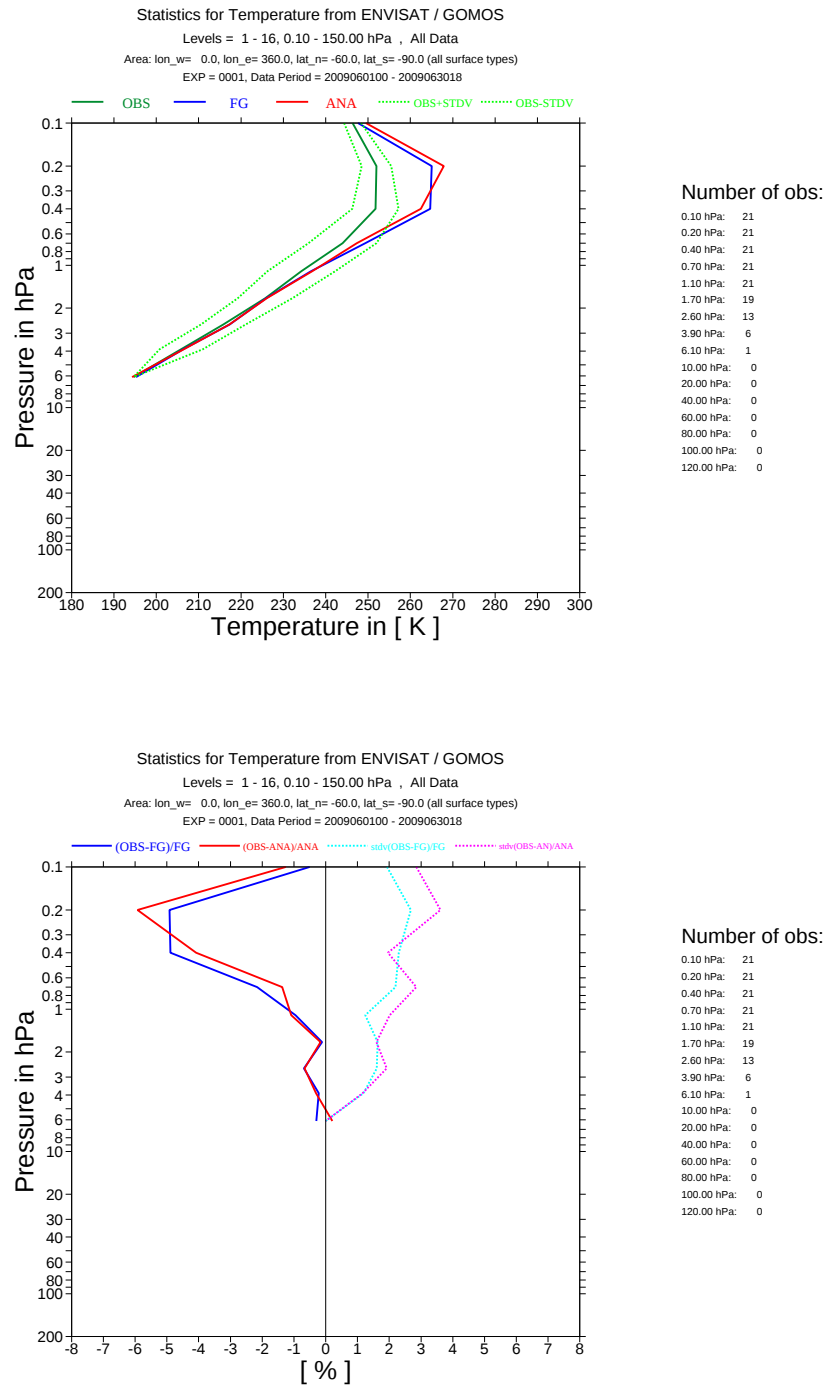


Fig. 5. As Fig. 3 but for 60-90S.

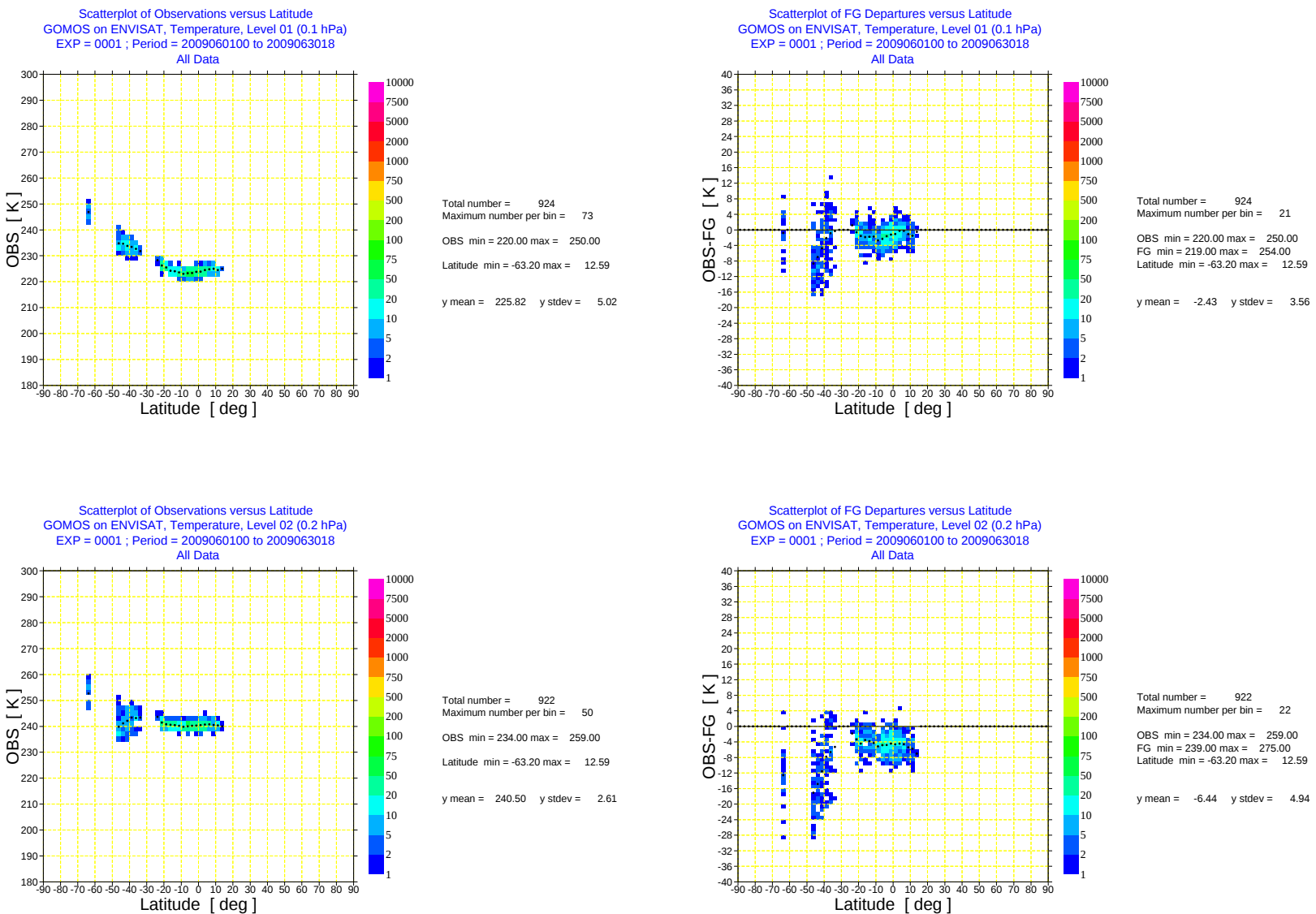


Fig. 6. Scatter plot of ENVISAT GOMOS NRT temperature data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT temperature data against latitude (right) for June 2009 for level 1 (0.1 hPa) and level 2 (0.2 hPa). The colours show the number of data per bin, and the black dots the mean value per bin.

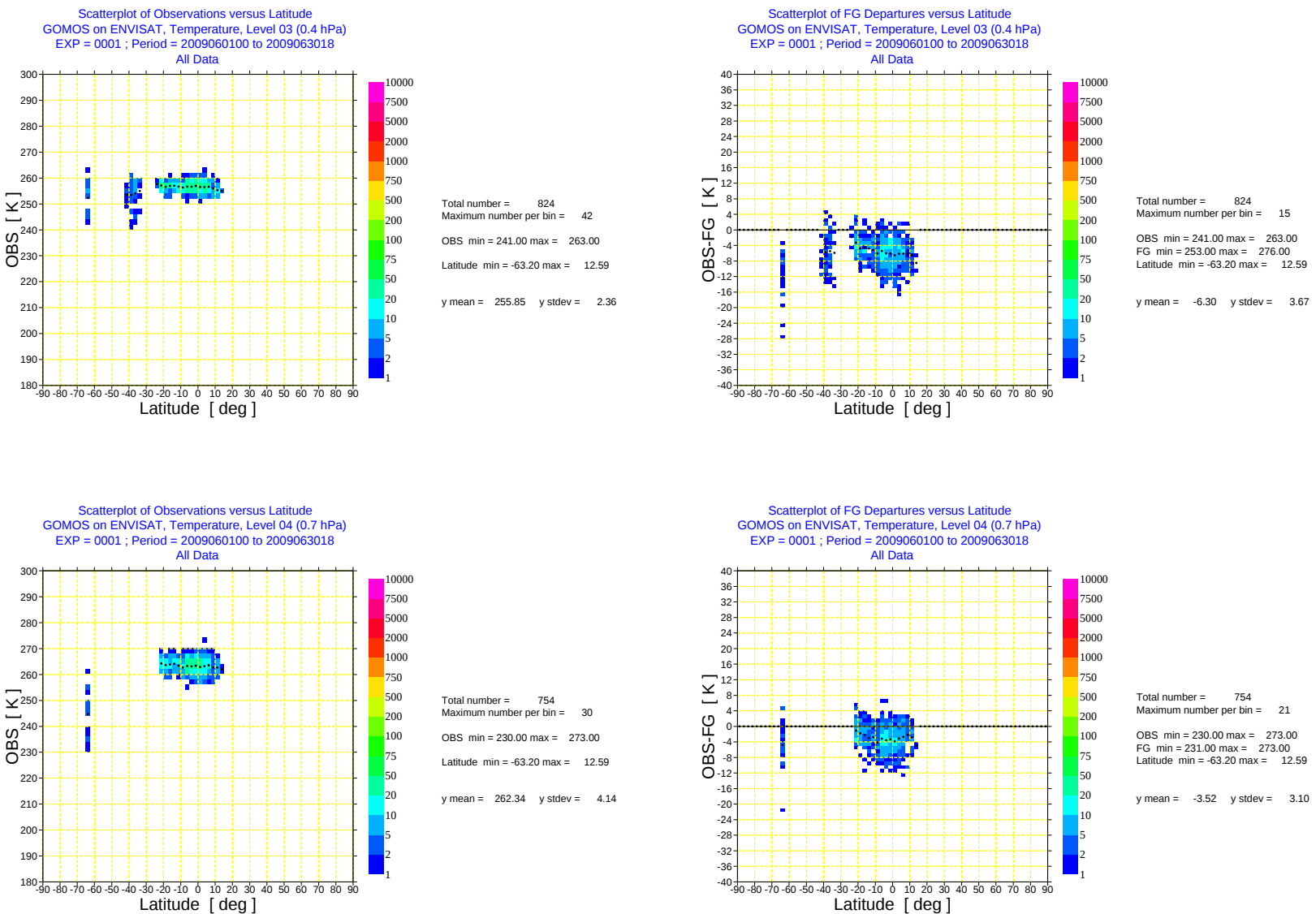


Fig. 7. As Fig. 6 but for level 3 (0.4 hPa) and level 4 (0.7 hPa).

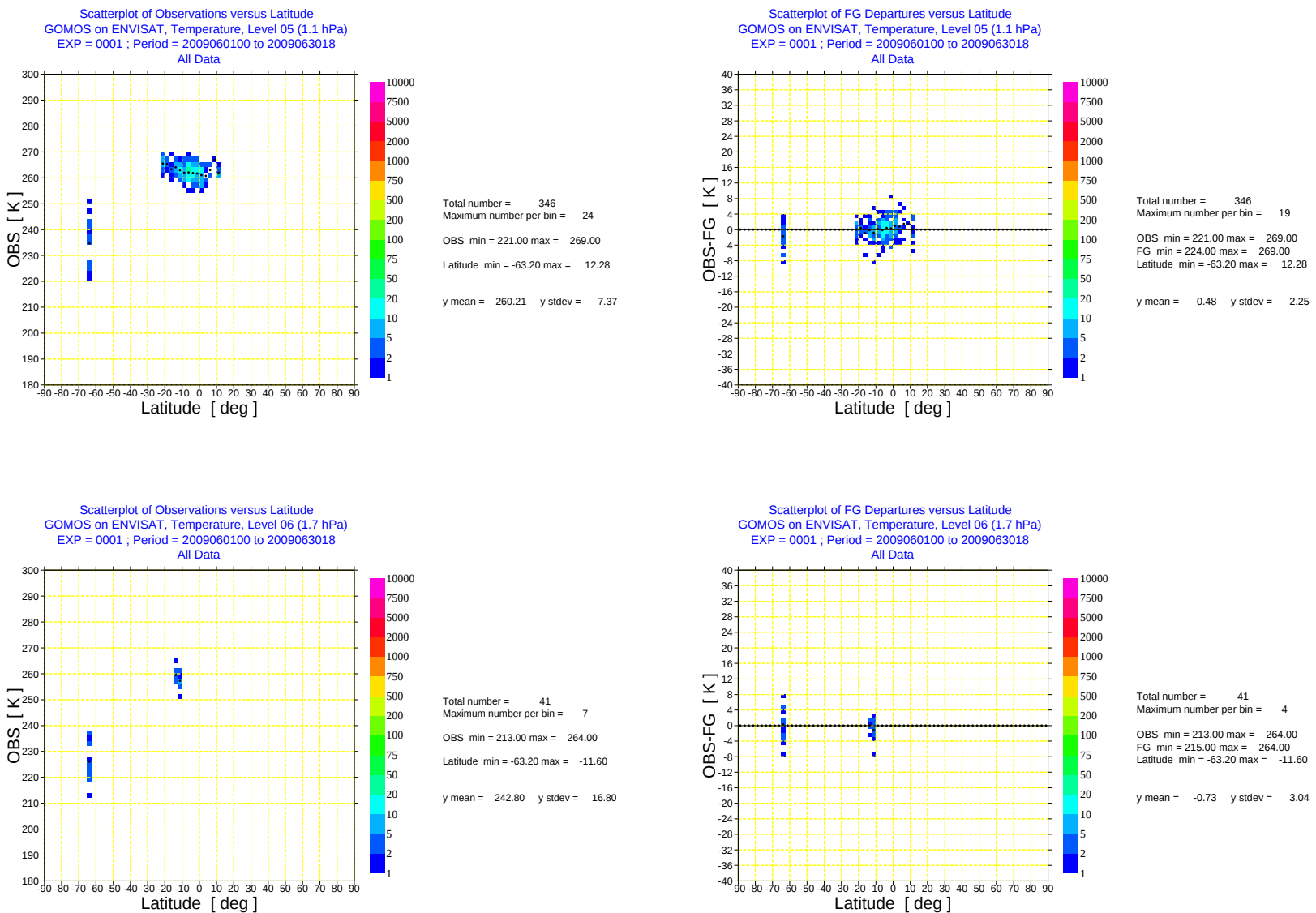


Fig. 8. As Fig. 6 but for level 5 (1.1 hPa) and level 6 (1.7 hPa).

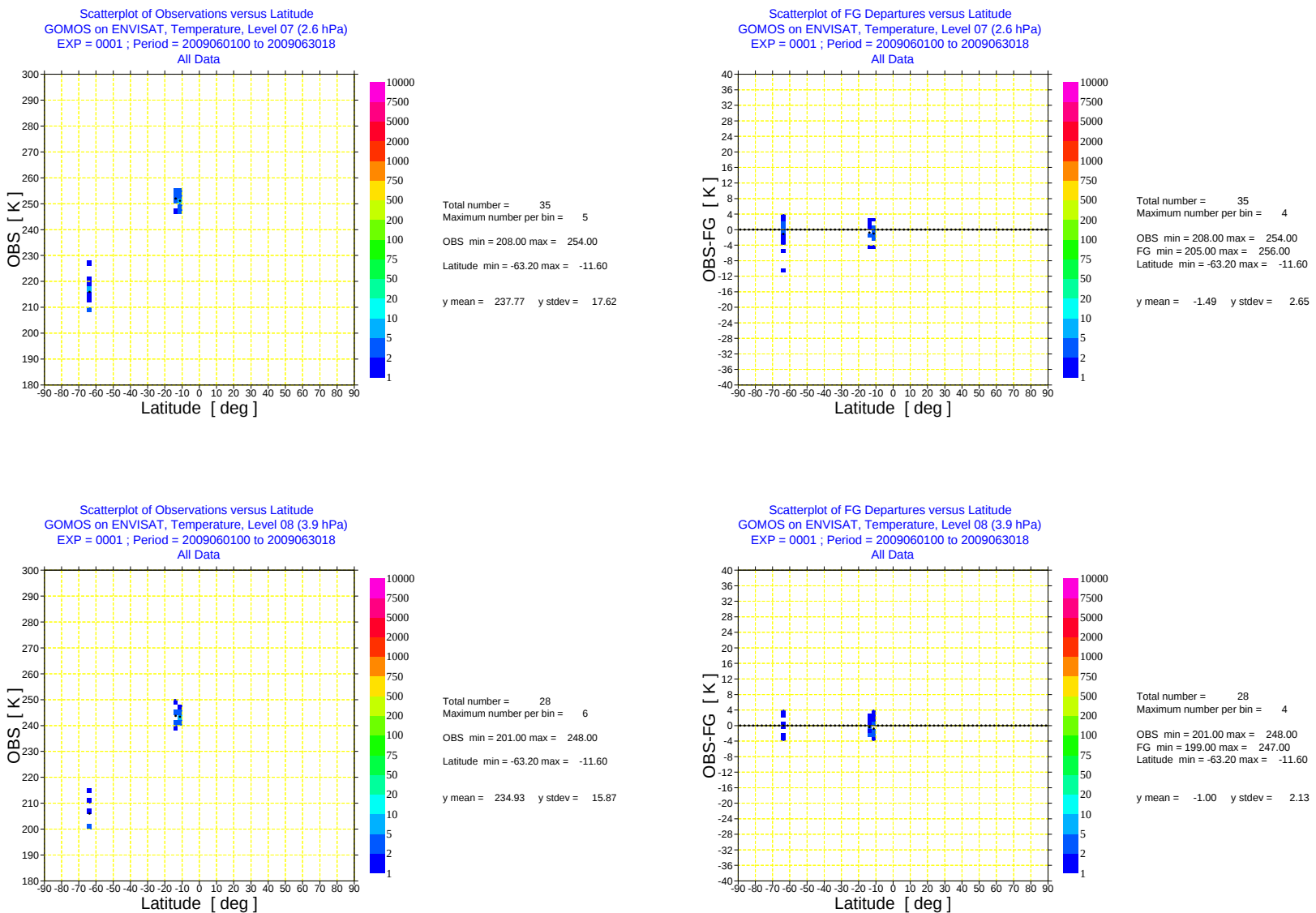


Fig. 9. As Fig. 6 but for level 7 (2.6 hPa) and level 8 (3.9 hPa).

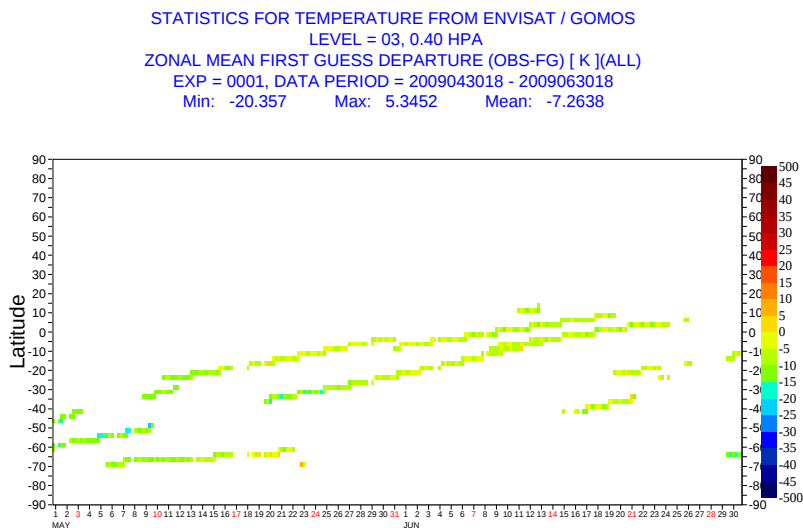
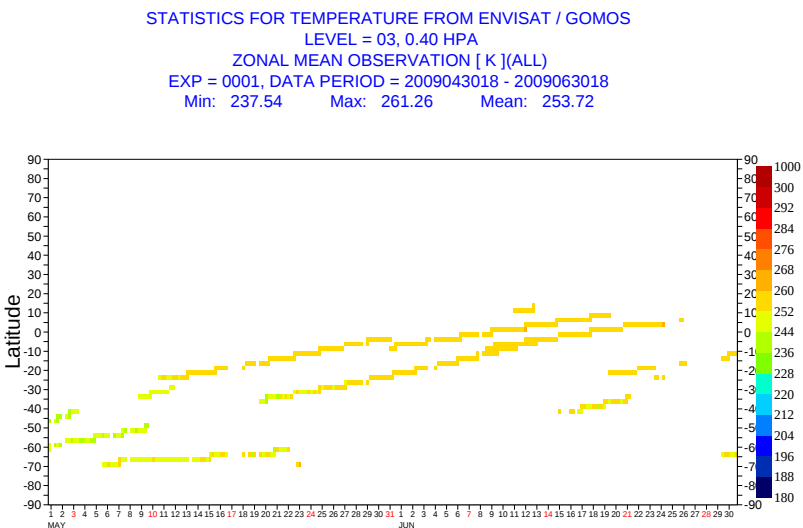
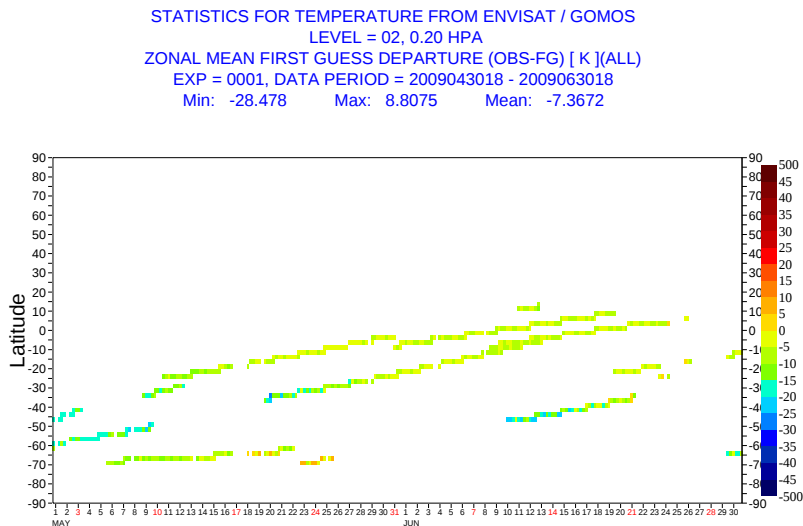
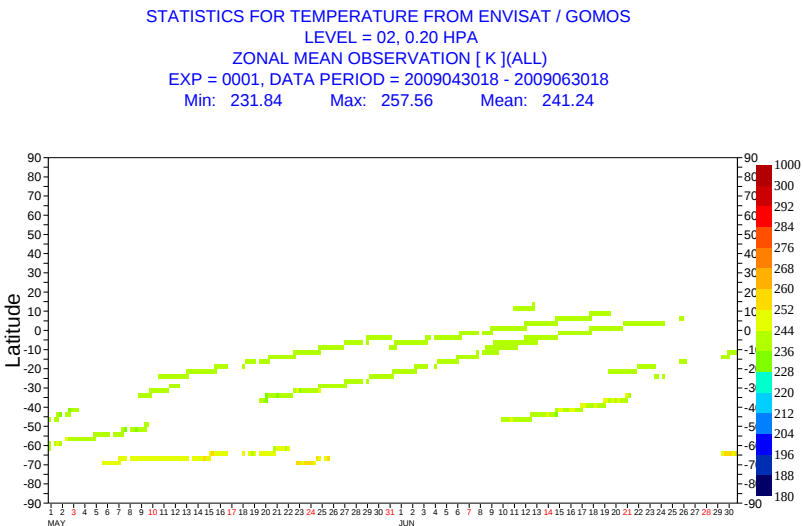


Fig. 10. Hovmöller diagram of zonal mean ENVISAT GOMOS NRT temperature data per 6-hour cycle and of the zonal mean first-guess departures for level 2 (0.2 hPa) and level 3 (0.4 hPa) for May-June 2009.

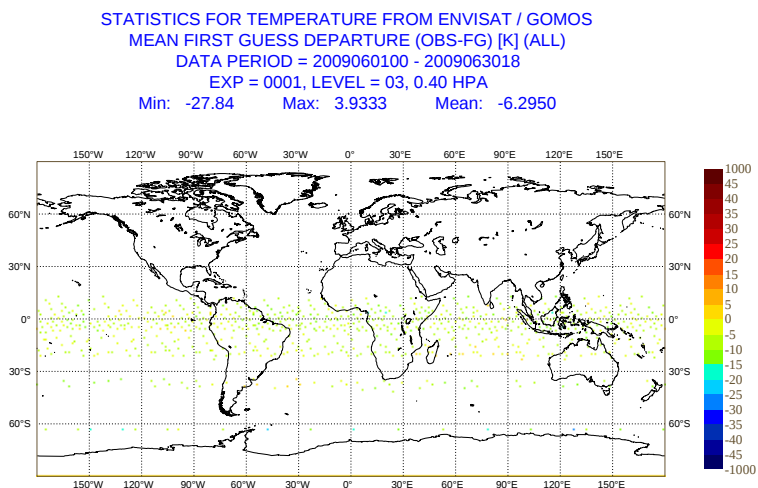
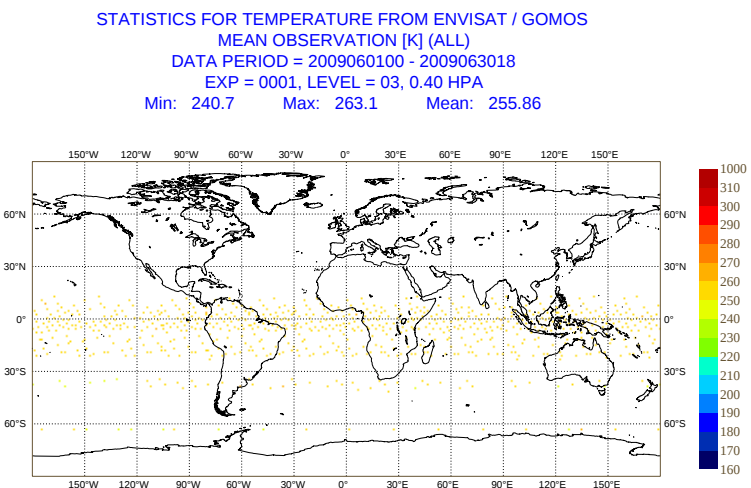
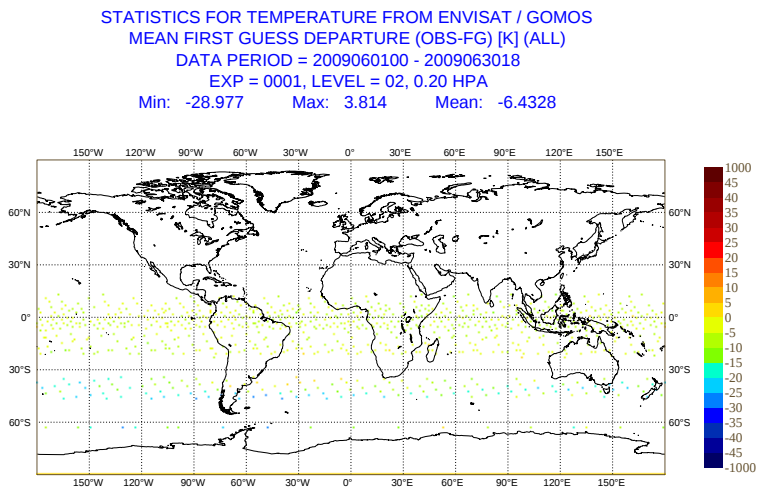
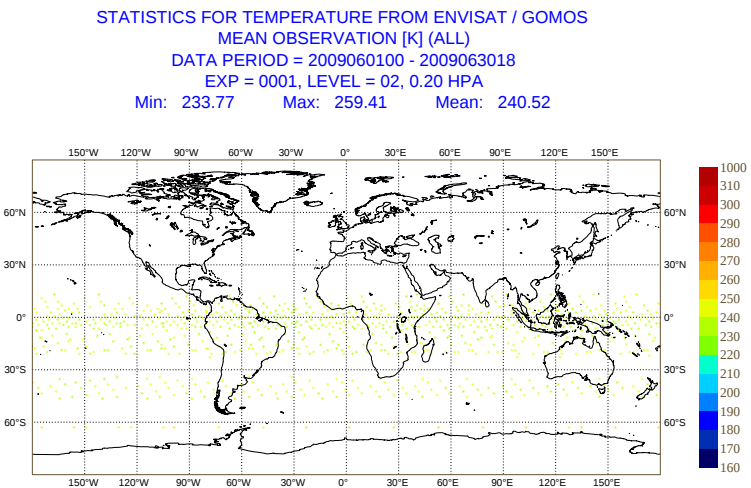


Fig. 11. Geographical distribution of mean ENVISAT GOMOS NRT temperature data and mean first-guess departures for level 2 (0.2 hPa) and level 3 (0.4 hPa) for June 2009.

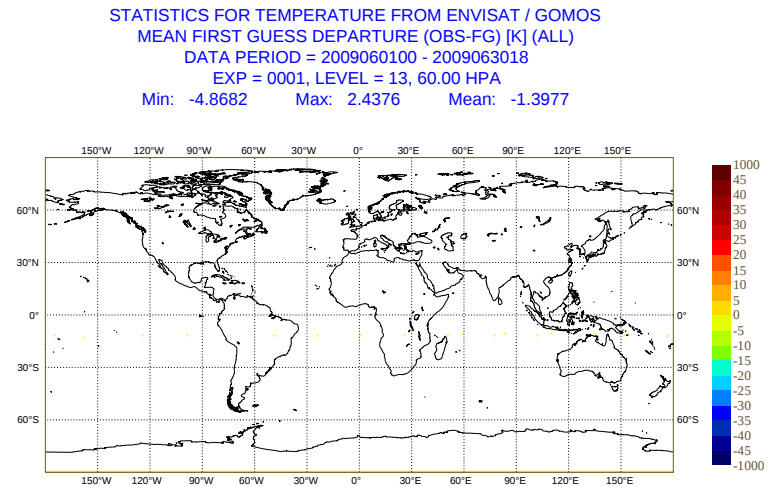
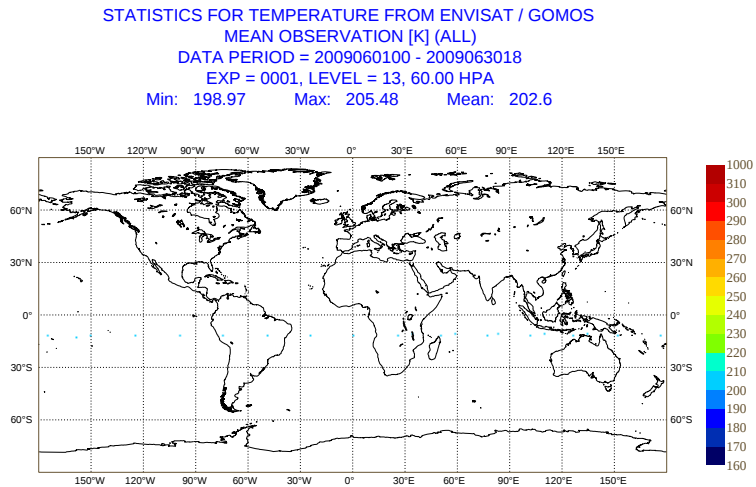
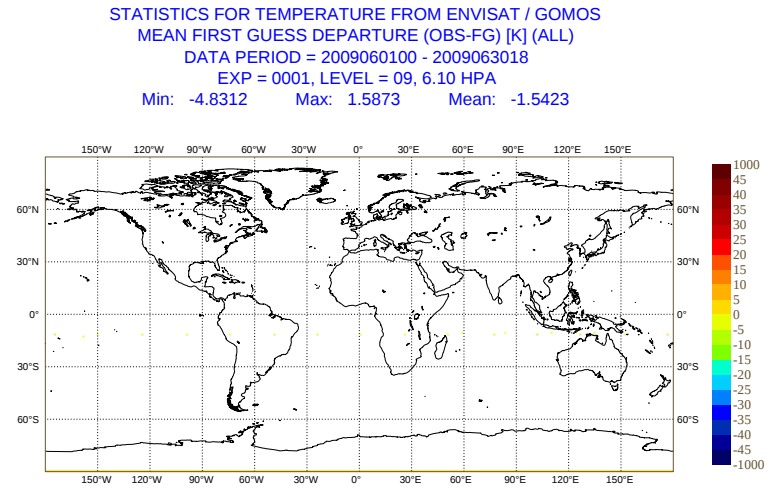
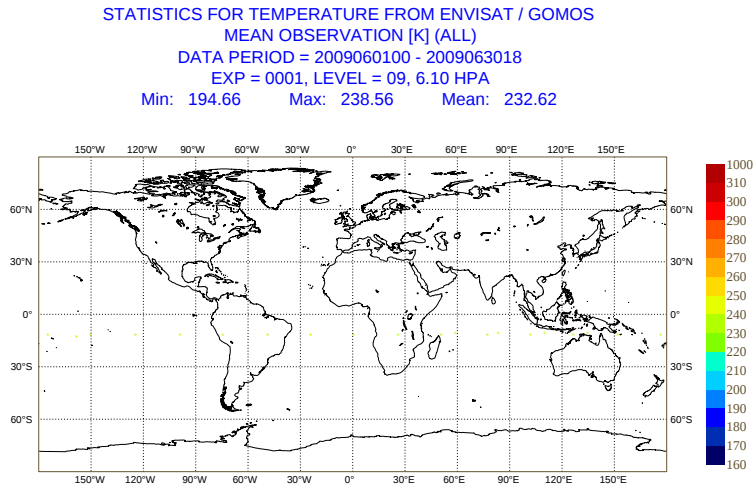


Fig. 12. As Fig. 11 but for level 9 (6.1 hPa) and level 13 (60 hPa).

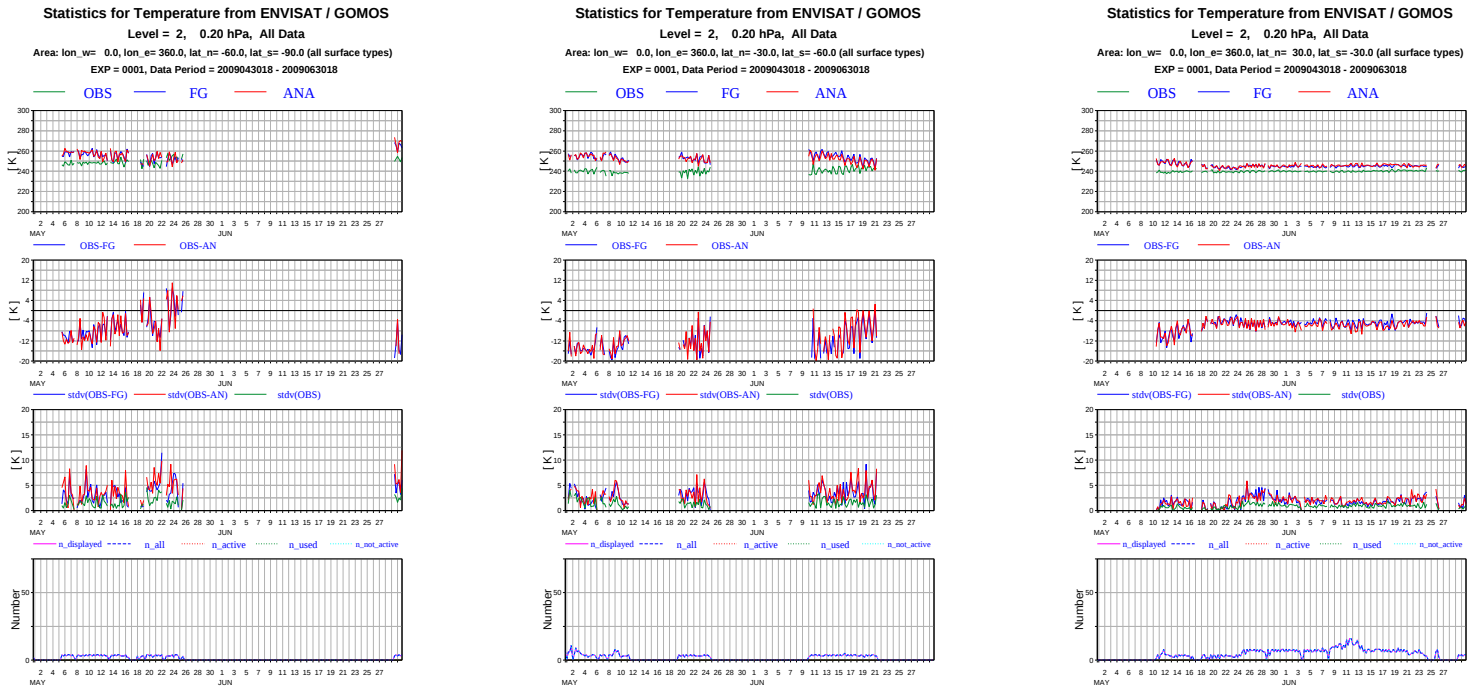


Fig. 13. Timeseries of mean ENVISAT GOMOS NRT temperature data, first guess and analysis values (top panels), first-guess and analysis departures (second panels), standard deviations (third panels) and number of data (bottom panels) per 6-hour cycle for level 2 (0.2 hPa) 30N-30S, 30-60S, and 60-90S for the period May-June 2009.

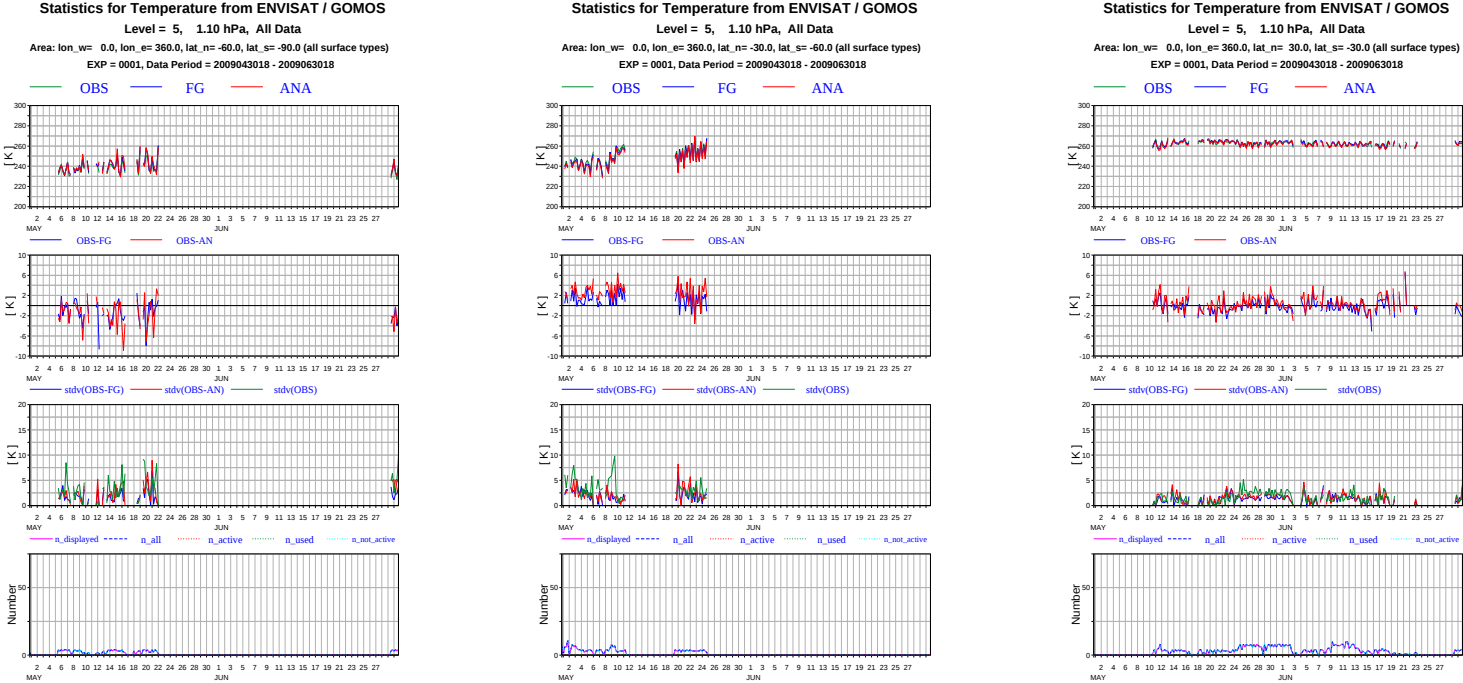


Fig. 14. As Figure 13, but for level 5 (1.1 hPa).

REPORT ABOUT ENVISAT GOMOS NRT WATER VAPOUR DATA (GOM_RR_2P) FOR JUNE 2009

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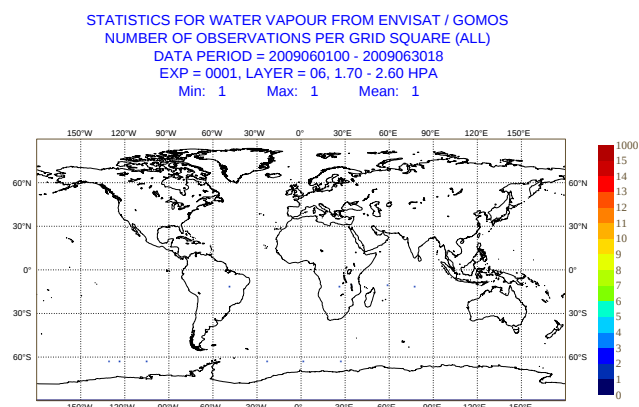


Fig. 1. Geographical distribution of mean number of ENVISAT GOMOS NRT water vapour data for level 6 (1.7-2.6 hPa) for June 2009.

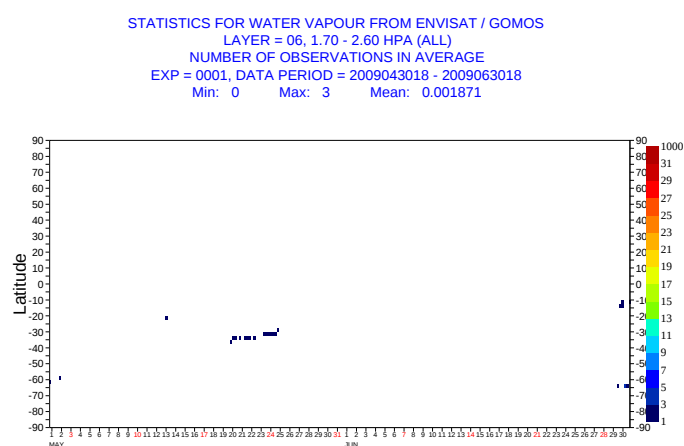


Fig. 2. Hovmoeller diagram of zonal mean number of data of ENVISAT GOMOS NRT water vapour data per 6-hour cycle for level 6 (1.7-2.6 hPa) for May-June 2009.

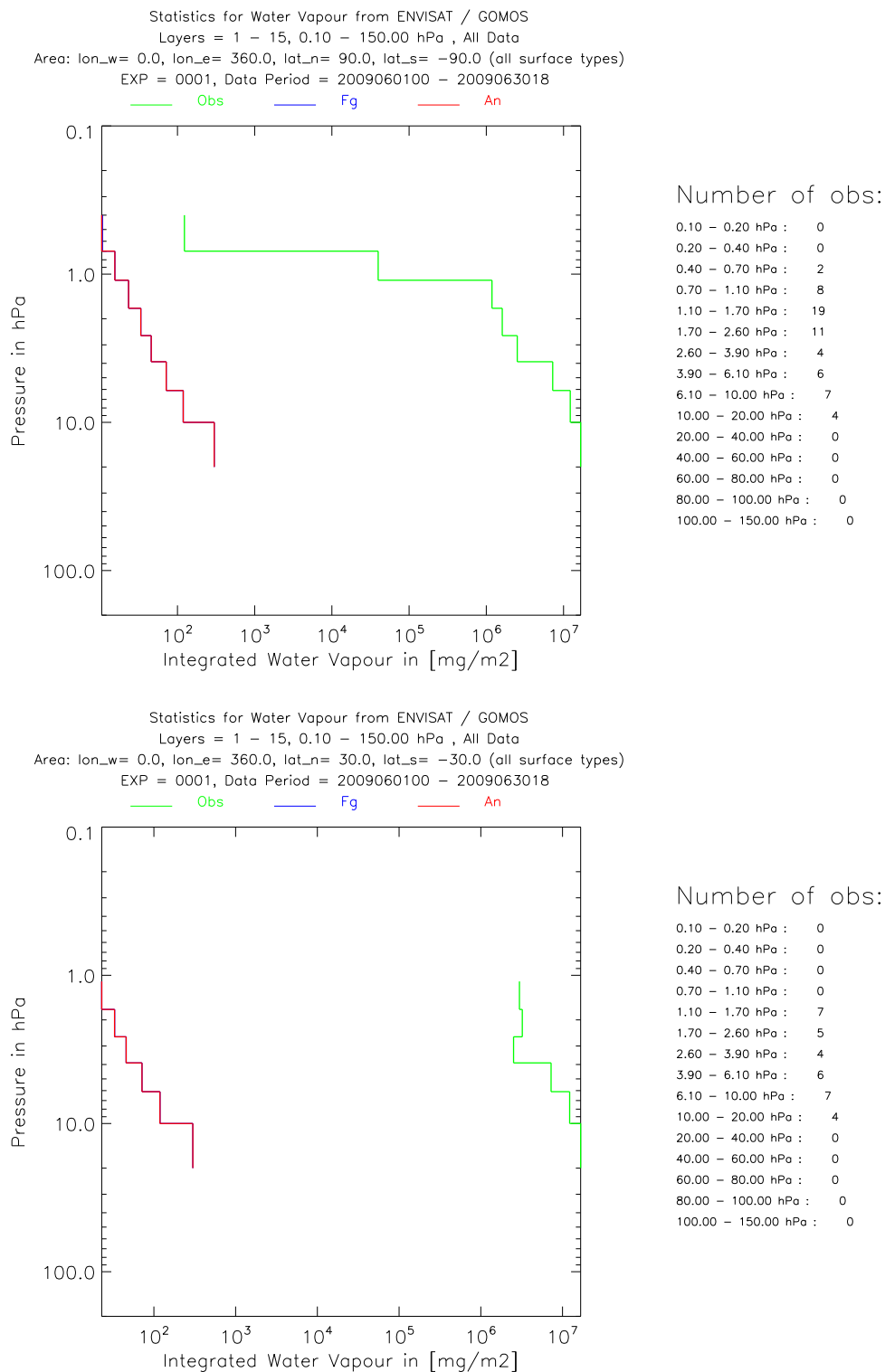


Fig. 3. Time mean vertical distribution of ENVISAT GOMOS NRT water vapour data in mg/m^2 for June 2009. The top plot shows the mean analysis values (red), the mean first-guess (blue), the mean observation (green) globally averaged. The bottom plot shows a similar plot for the tropical band (30N-30S). Plotted are the partial columns for the 16 levels listed to the right of the diagrams.

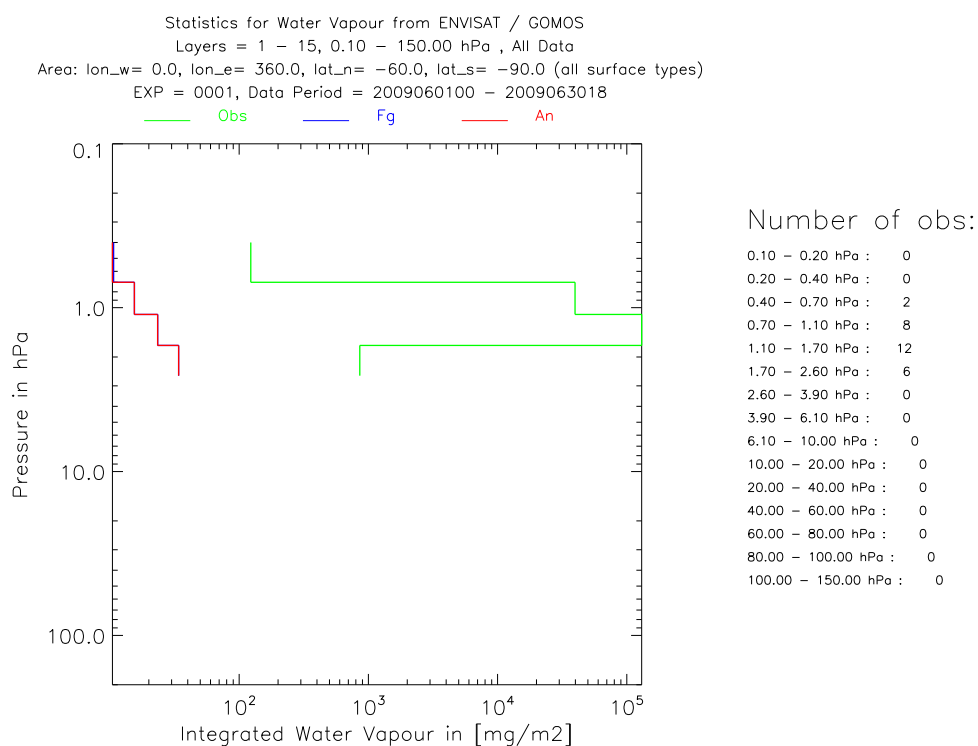


Fig. 4. As Fig. 3 but for 3 60-90S.

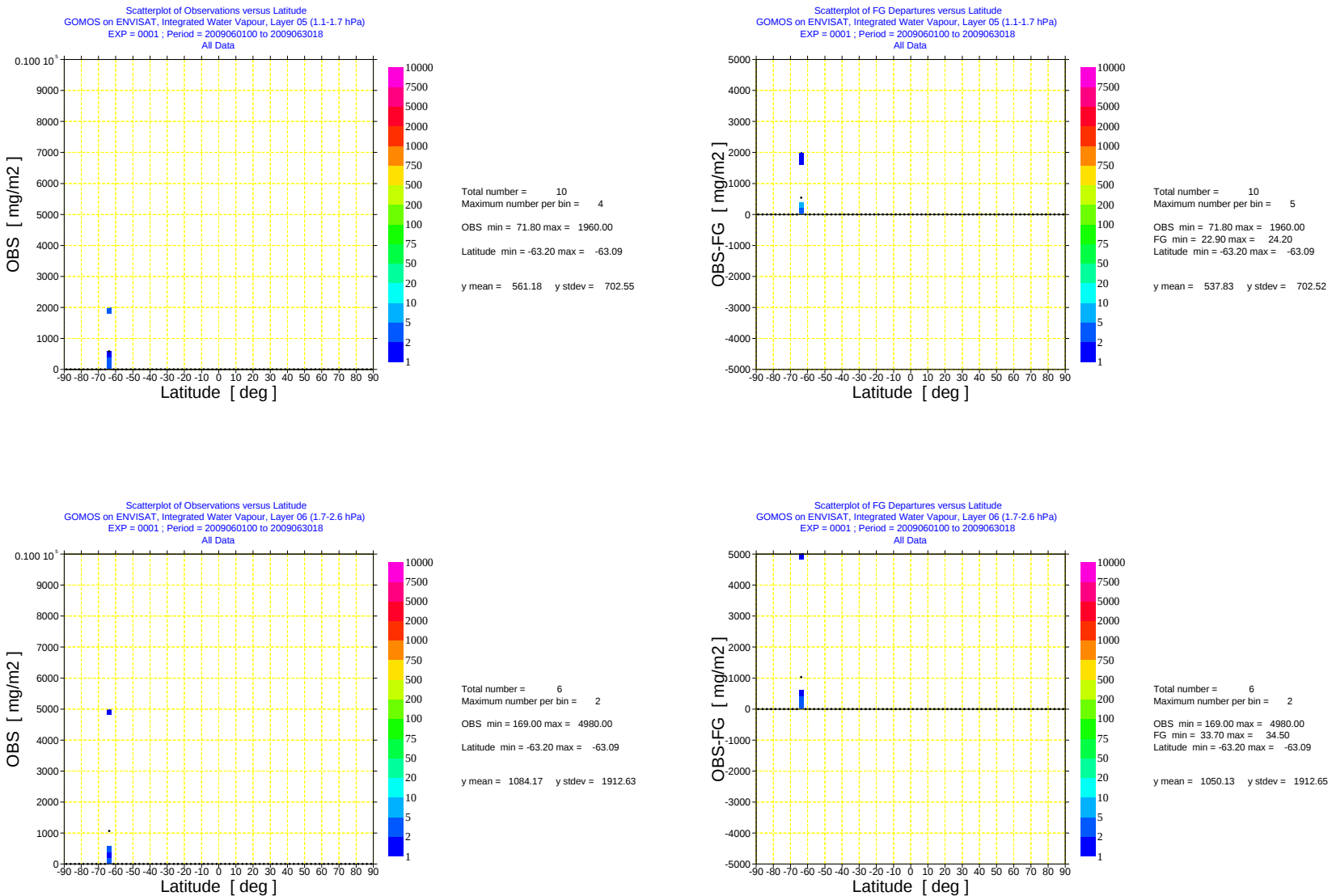


Fig. 5. Scatter plot of ENVISAT GOMOS NRT water vapour data against latitude (left) and scatter plot of first-guess departures of ENVISAT GOMOS NRT water vapour data against latitude (right) for June 2009 for level 5 (1.1 hPa) and level 6 (1.7 hPa). The colours show the number of data per bin, and the black dots the mean value per bin.