INVESTIGATION IN TO ERRORS IN THE DRY TROPOSPHERIC CORRECTION OVER ANTARCTICA FOR ENVISAT GDR V2.1 REPROCESSED DATA.

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SUMMARY

This investigation looked at the use of the Dry Tropospheric Correction over Antarctic ice sheets in the Envisat GDR v2.1 data set (cycles 10-93) , reprocessed during 2011.

The Dry Tropospheric correction is the largest atmospheric correction used in the calculation of surface elevation and any irregularities in this correction can cause significant errors in long term elevation monitoring of continental ice.

An original investigation in 2009 by *F. Blarel, S. Parouty and F. Remy* at *LEGOS*, entitled 'ENVISAT RA2 Dry Troposphere Correction for Ice Sheets' reported jumps in the Dry Tropospheric correction at cycles 40 and 55 in the original GDR data set which they believe are due to changes in the topography used in the correction calculation by the CNES/CMA and also due to the introduction of S1S2 waves in the computation of surface pressure.

This study repeats a similar analysis on the full mission reprocessed data set (GDR v2.1) to see if the previous irregularities and jumps in the Dry Tropospheric correction have been fixed or not. To do this we performed a crossover analysis using a fixed reference cycle (cycle 73) and compared the r.m.s differences and difference maps in the dry tropospheric correction for cycles 10-87 and 93.

We can conclude that there is still a serious problem with the Dry Tropospheric Correction over Antarctic land surfaces in the GDR v2.1 products with a jump of ~6cm occurring at cycle 45.

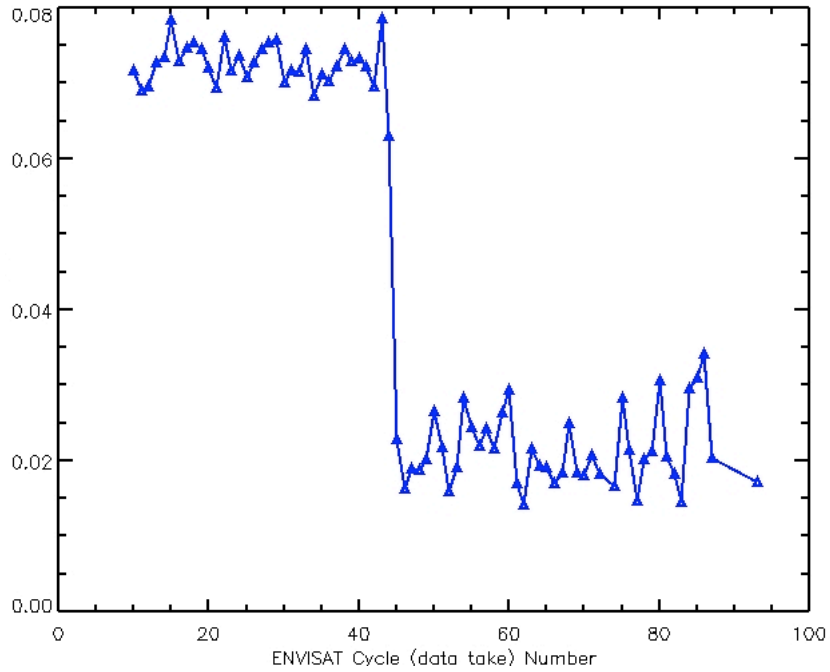
We recommend that the Dry Tropospheric correction is replaced by a recalculated correction when used for long term continental ice studies and that information concerning this issue be added to the product disclaimer.

We further recommend that a solution to this problem is urgently found and that correctly reprocessed Dry Tropospheric correction is made available as soon as possible as an ancilliary data file and subsequently added to the next reprocessing of the GDR product.

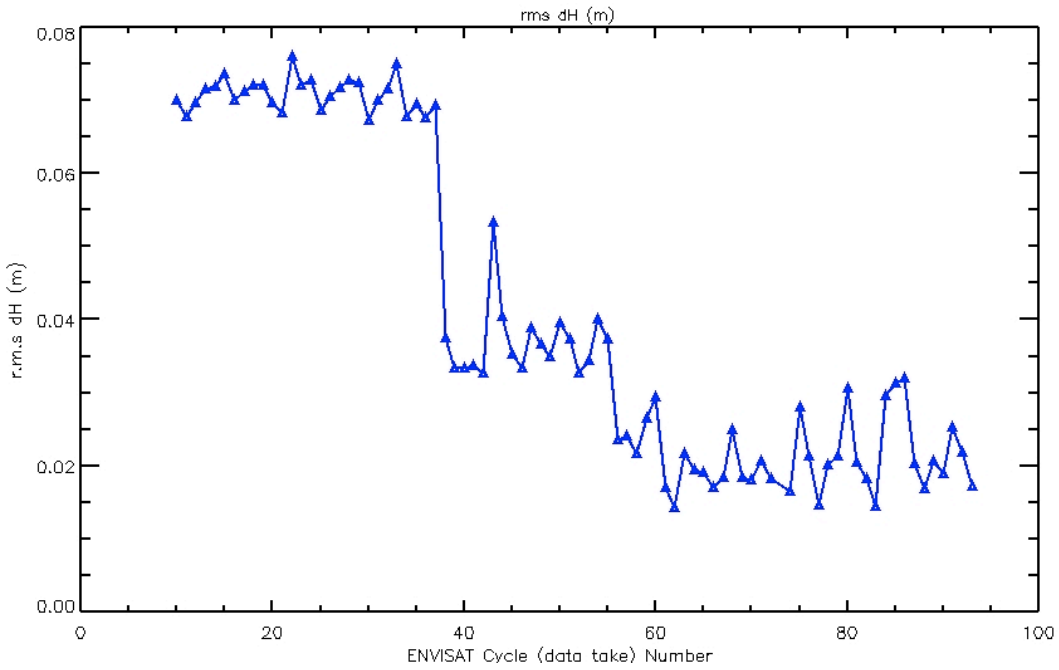
RESULTS

The r.m.s difference in the Dry Tropospheric correction over Antarctic land between a single reference cycle (73) and cycle 10-93 clearly show a large jump of ~6cm at cycle 44-45.

r.m.s Dry Tropospheric Correction Difference (m) vs cycle 73 for GDR v2.1 (cycle 10-93)



We can compare this to a similar analysis performed using GDR-A/B/C prior to the 2011 reprocessing:

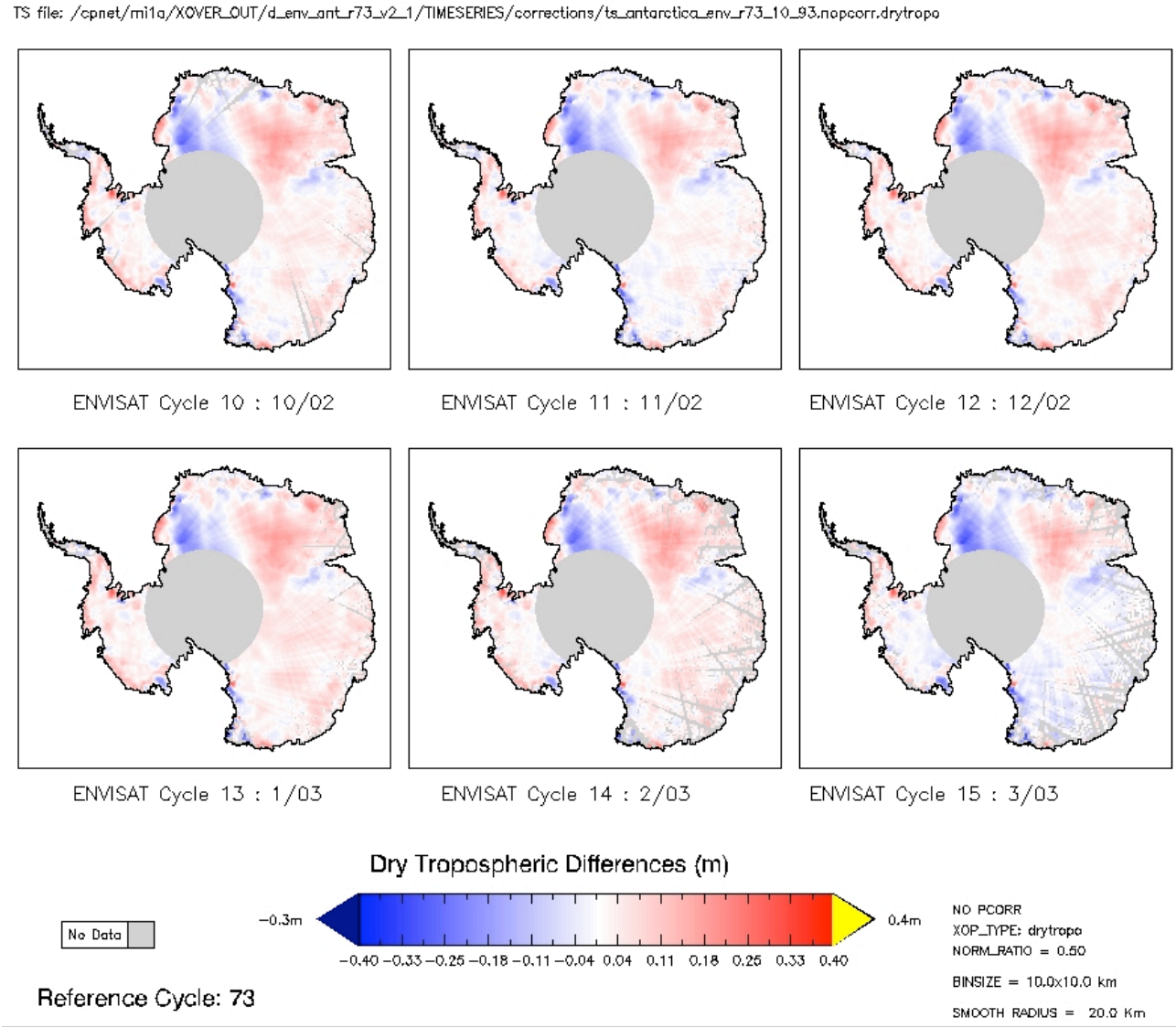


This shows two steps in the correction r.m.s (at ~cycle 40 and 55) as reported by LEGOS in 2009.

Next we look at maps of the Dry Tropospheric correction differences compared to reference cycle 73. From this we can clearly see the change from cycle 45 onwards. A sample set of cycle maps is shown below:

Maps of Dry Tropospheric Differences vs Cycle 73
GDR v2.1

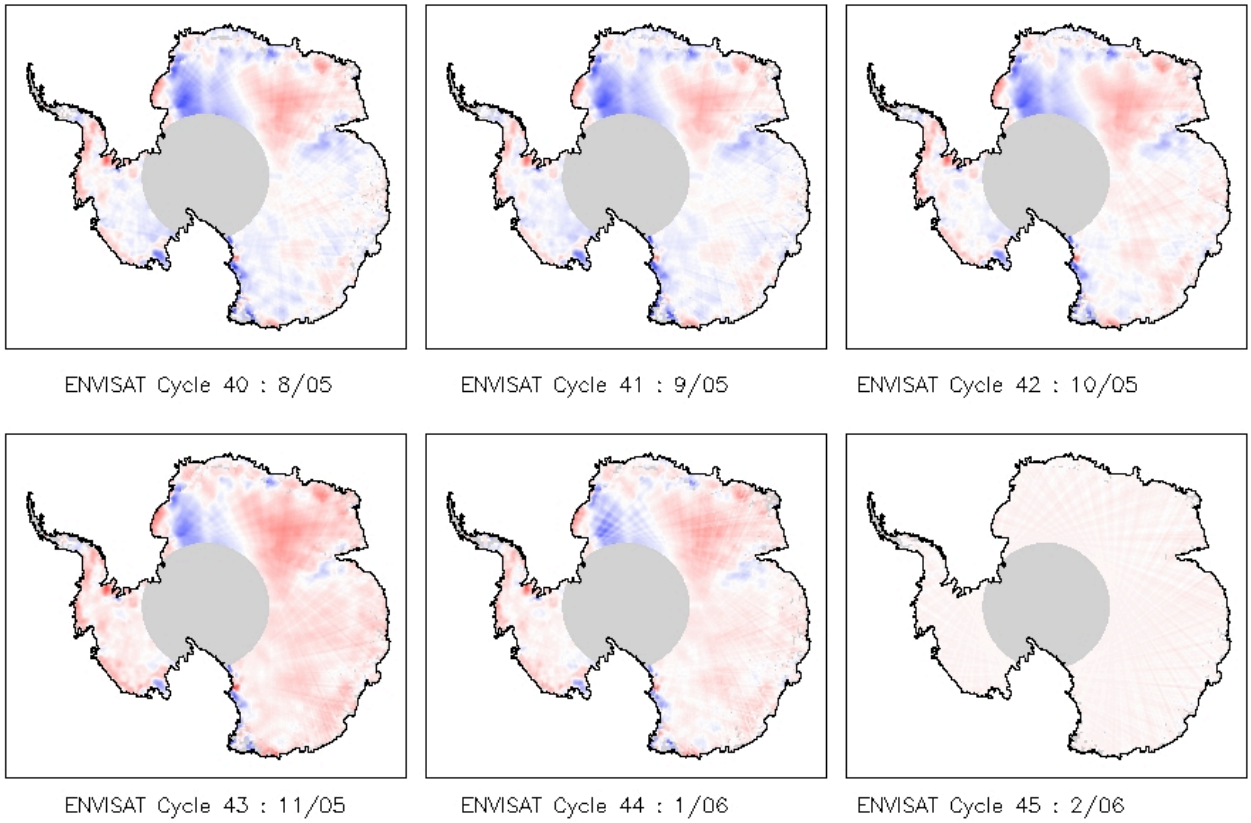
Cycle 10-15 vs Cycle 73



Maps of Dry Tropospheric Differences vs Cycle 73
GDR v2.1

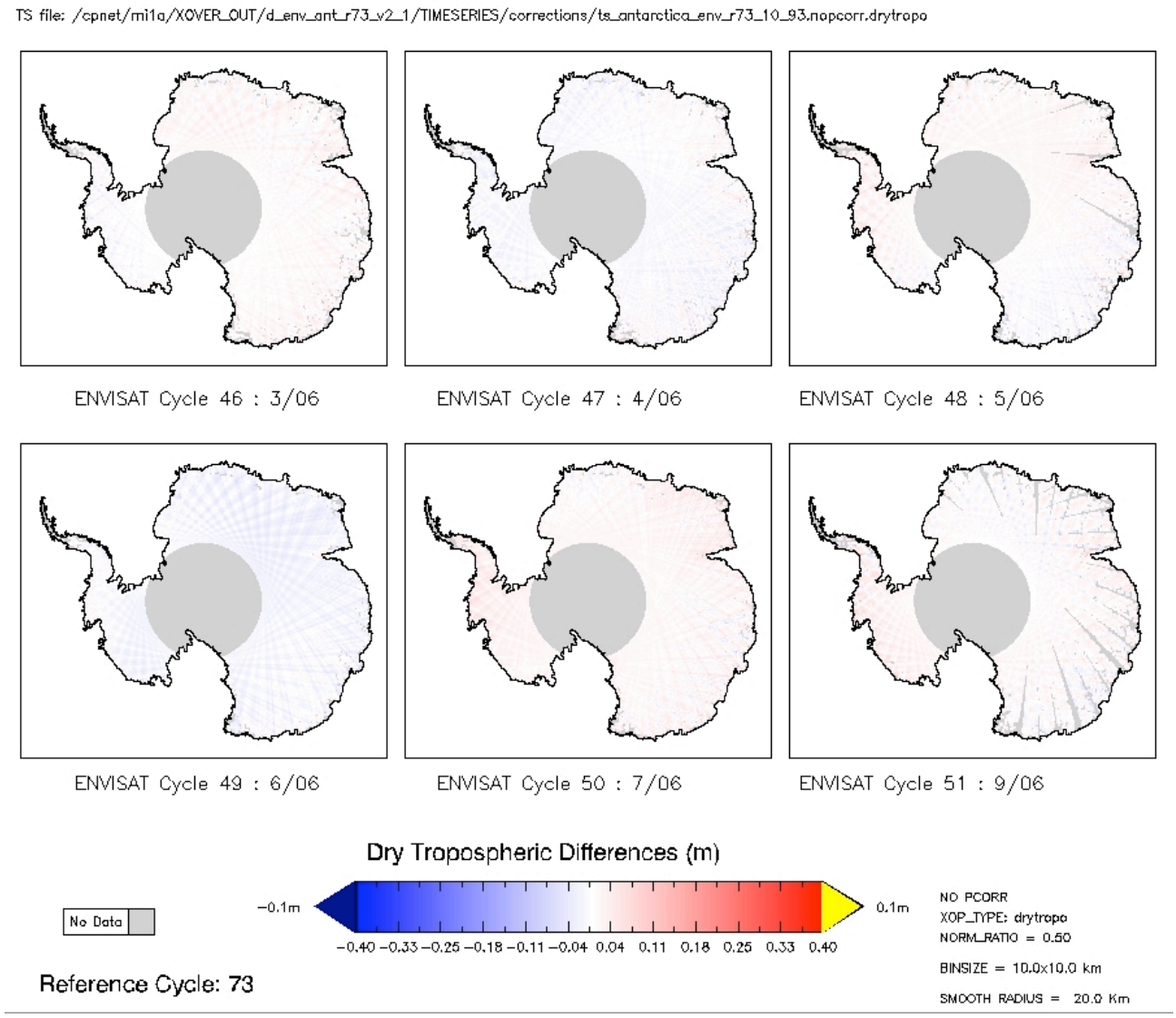
Cycle 40-45 vs Cycle 73

TS file: /cpnet/mi1a/XOVER_OUT/d_env_ant_r73_v2_1/TIMESERIES/corrections/ts_antarctica_env_r73_10_93.nopcorr.drytropo



Maps of Dry Tropospheric Differences vs Cycle 73
GDR v2.1

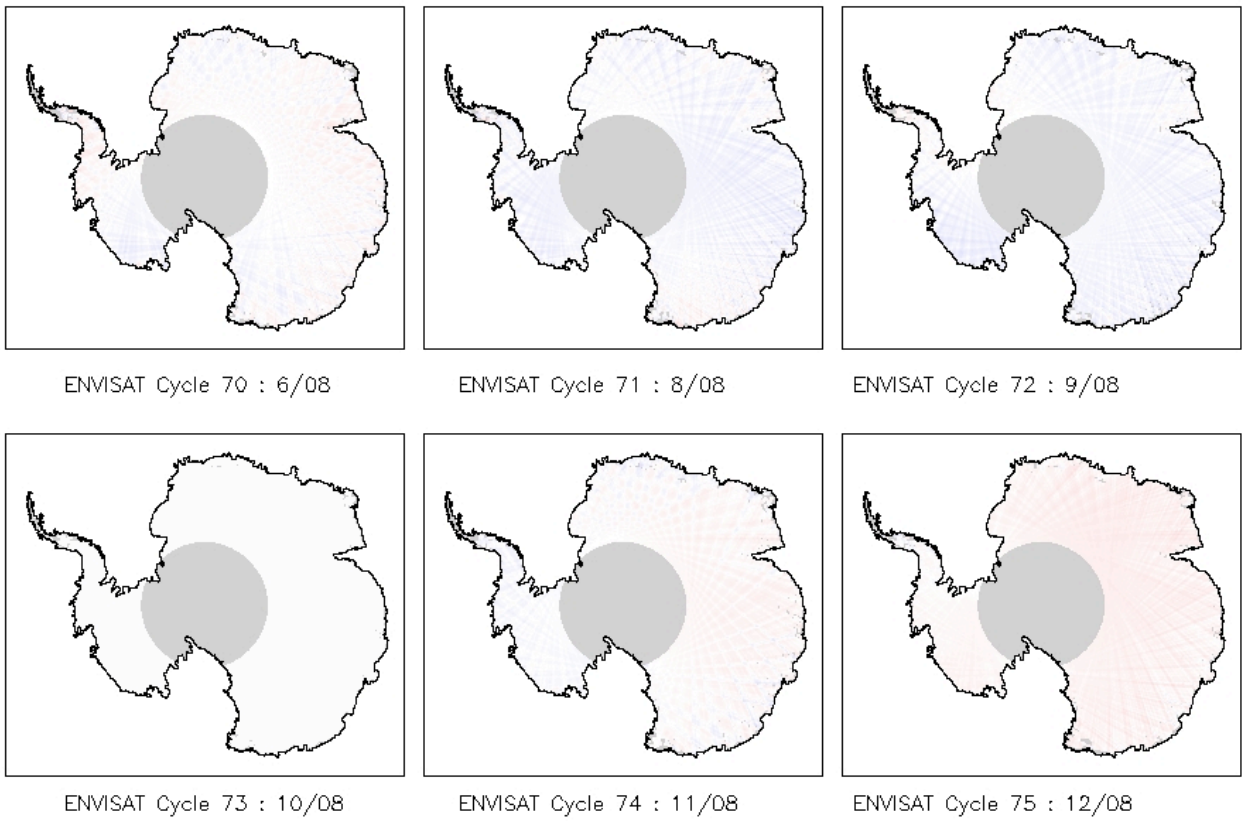
Cycle 46-51 vs Cycle 73



Maps of Dry Tropospheric Differences vs Cycle 73
GDR v2.1

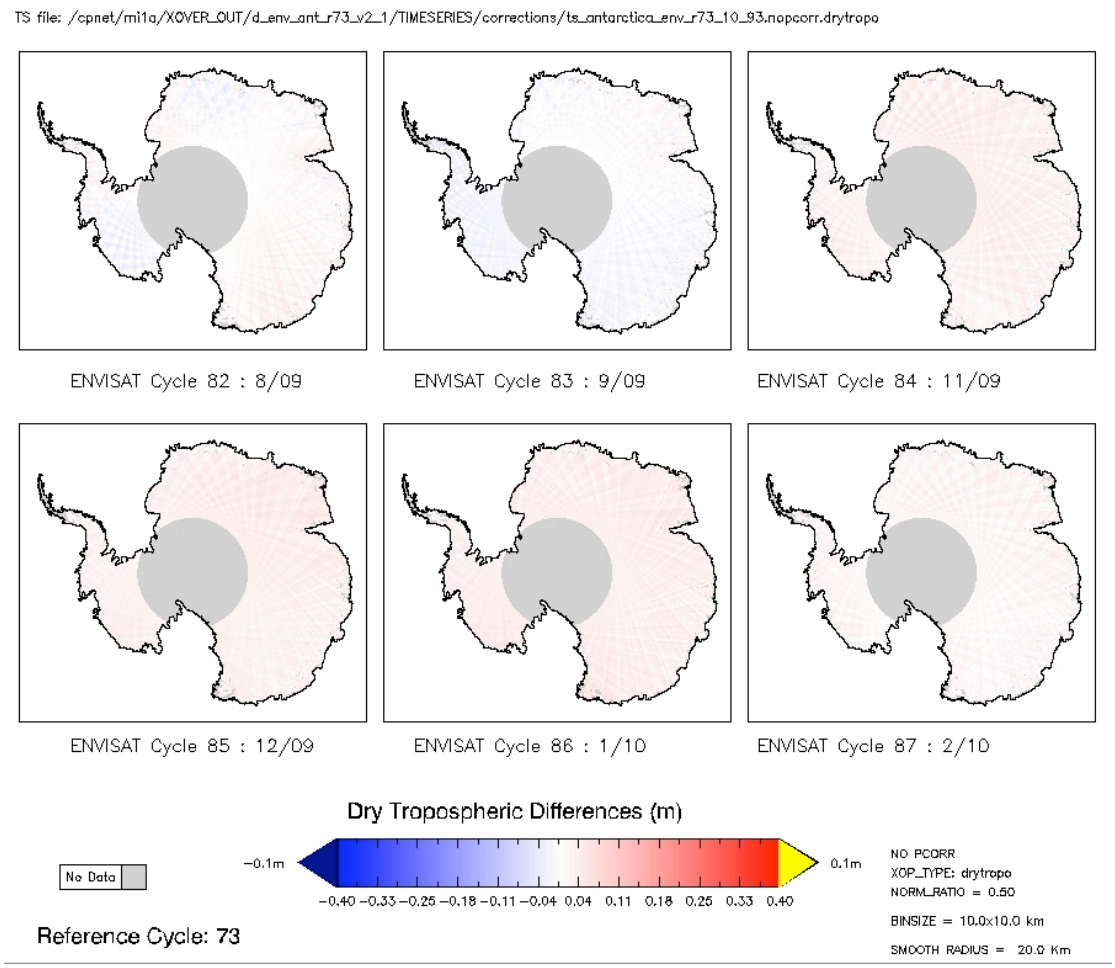
Cycle 70-75 vs Cycle 73

TS file: /cpnet/mi1a/XOVER_OUT/d_env_ant_r73_v2_1/TIMESERIES/corrections/ts_antarctica_env_r73_10_93.nopcorr.drytropo



Maps of Dry Tropospheric Differences vs Cycle 73
GDR v2.1

Cycle 82-87 vs Cycle 73



CONCLUSION

We can conclude that there is still a serious problem with the Dry Tropospheric Correction over Antarctic land surfaces in the GDR v2.1 products with a jump of ~6cm occurring at cycle 45.

We recommend that the Dry Tropospheric correction is replaced by a recalculated correction when used for long term continental ice studies and that information concerning this issue be added to the product disclaimer.

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