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Supplement of

A wavelet-based approach to detect climate change on the coherent and turbulent component of the atmospheric circulation

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Supplementary material for ’A wavelet-based-approach to detect climate change on the coherent and turbulent component of the atmospheric circulation’

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1 Content

This supplementary file contains additional analyses to confirm the robustness of the technique in detecting climate change for the coherent and turbulent components of the velocity fields at 700hPha. We check the results against the change in the resolution of the model by using a Medium Resolution (MR) simulation of the IPSLCM5 model (2.5 X 1.25 in longitude and latitude). We compare MR against the low resolution (LR) (3.75 X 1.875 in longitude and latitude) simulation analyzed in the main text . Results for LR are reported in Figs 1-3 and in Figs 4-6 for MR.

Moreover, we test the results for three different time windows:

- 50years [2050/2100-2006/2056] , Figs 1,4,
- 40years [2060/2100-2006/2046] , Figs 2,5,
- 30years [2070/2100-2006/2036] , Figs 3,6.

The spatial structure of the observed changes is preserved with the change in resolution. By reducing the time window considered, the signal of climate change gets stronger, because the time separation between the periods analysed increases

To resume all the results presented here and in the manuscript, we also show the boxplots of the spatial probability distribution of changes in the integral of the autocorrelation function $\Delta\Lambda$ and in the spectral complexity $\Delta\Upsilon$ (Fig. 7). It is interesting to notice that the turbulent component $\Delta\Upsilon$ slightly increase by increasing the resolution: as expected, we find that adding finer scales corresponds to richer turbulent contributions, as finer structures are integrated in the model.

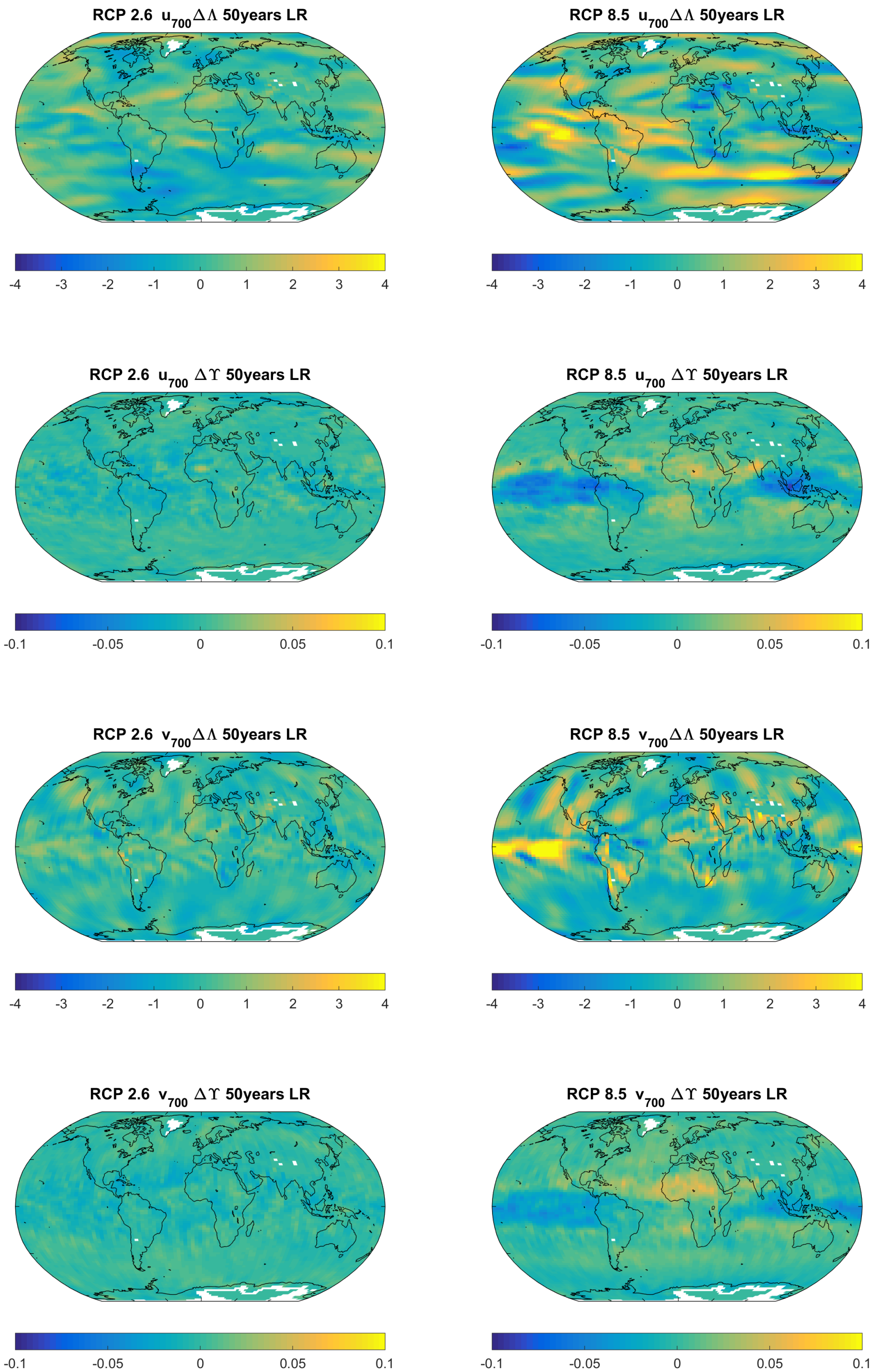

Figure 1. Low resolution (LR) Differences in the integral of the autocorrelation function $\Delta\Lambda$ and in the spectral complexity $\Delta\Upsilon$ for the 50 year period.

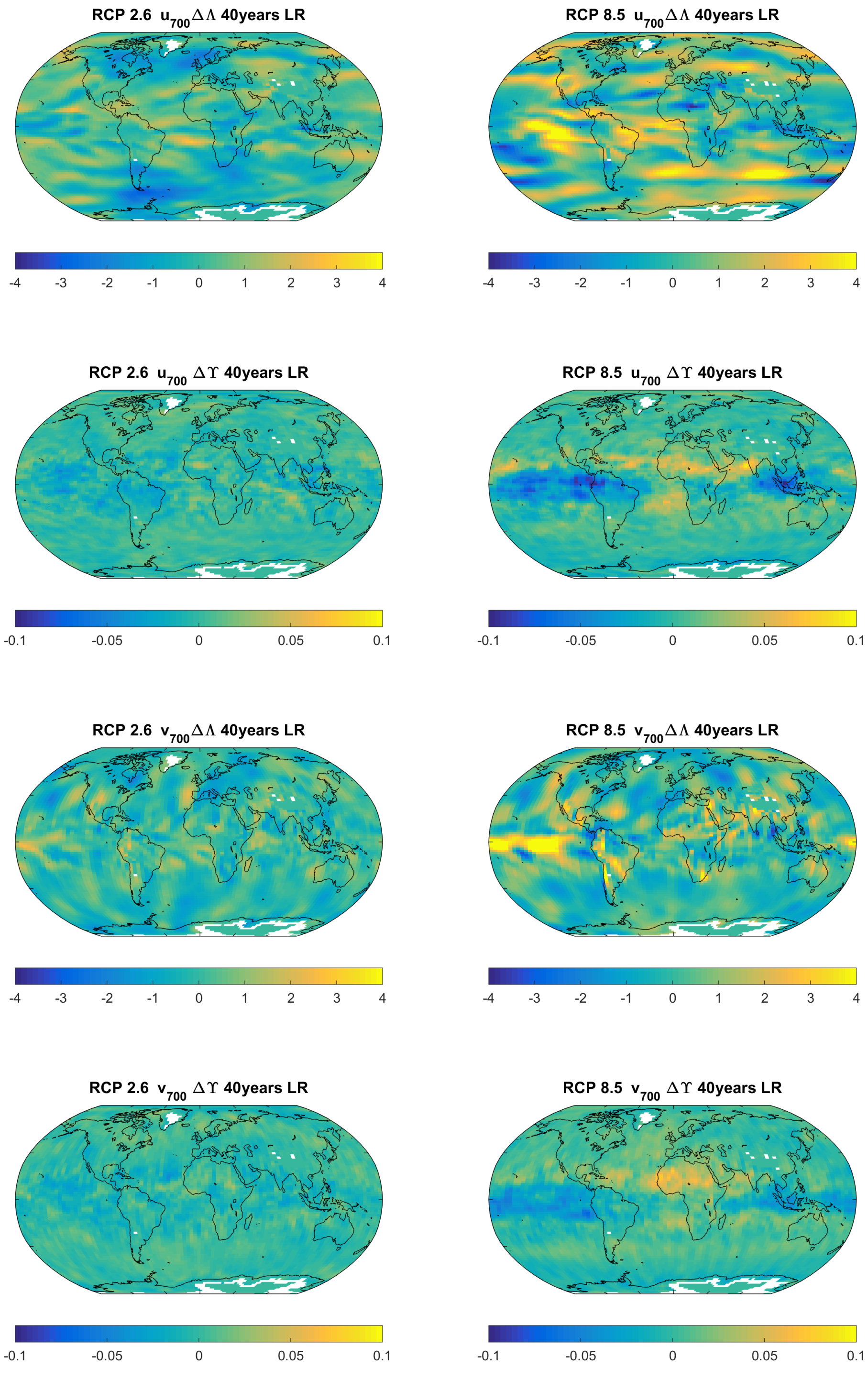

Figure 2. Low resolution (LR) Differences in the integral of the autocorrelation function $\Delta\Lambda$ and in the spectral complexity $\Delta\Upsilon$ for the 40 year period.

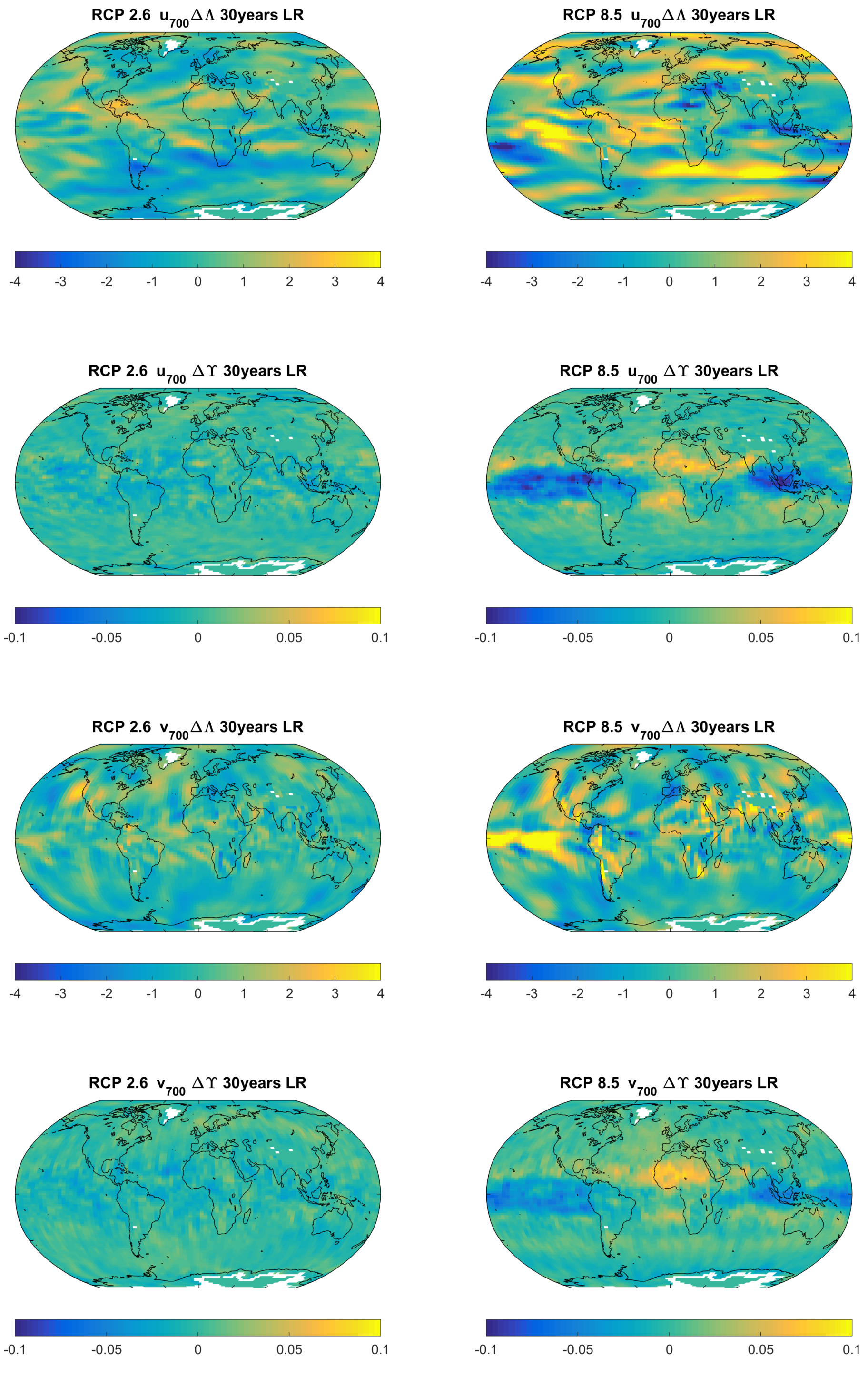

Figure 3. Low resolution (LR) Differences in the integral of the autocorrelation function $\Delta\Lambda$ and in the spectral complexity $\Delta\Upsilon$ for the 30 year period.

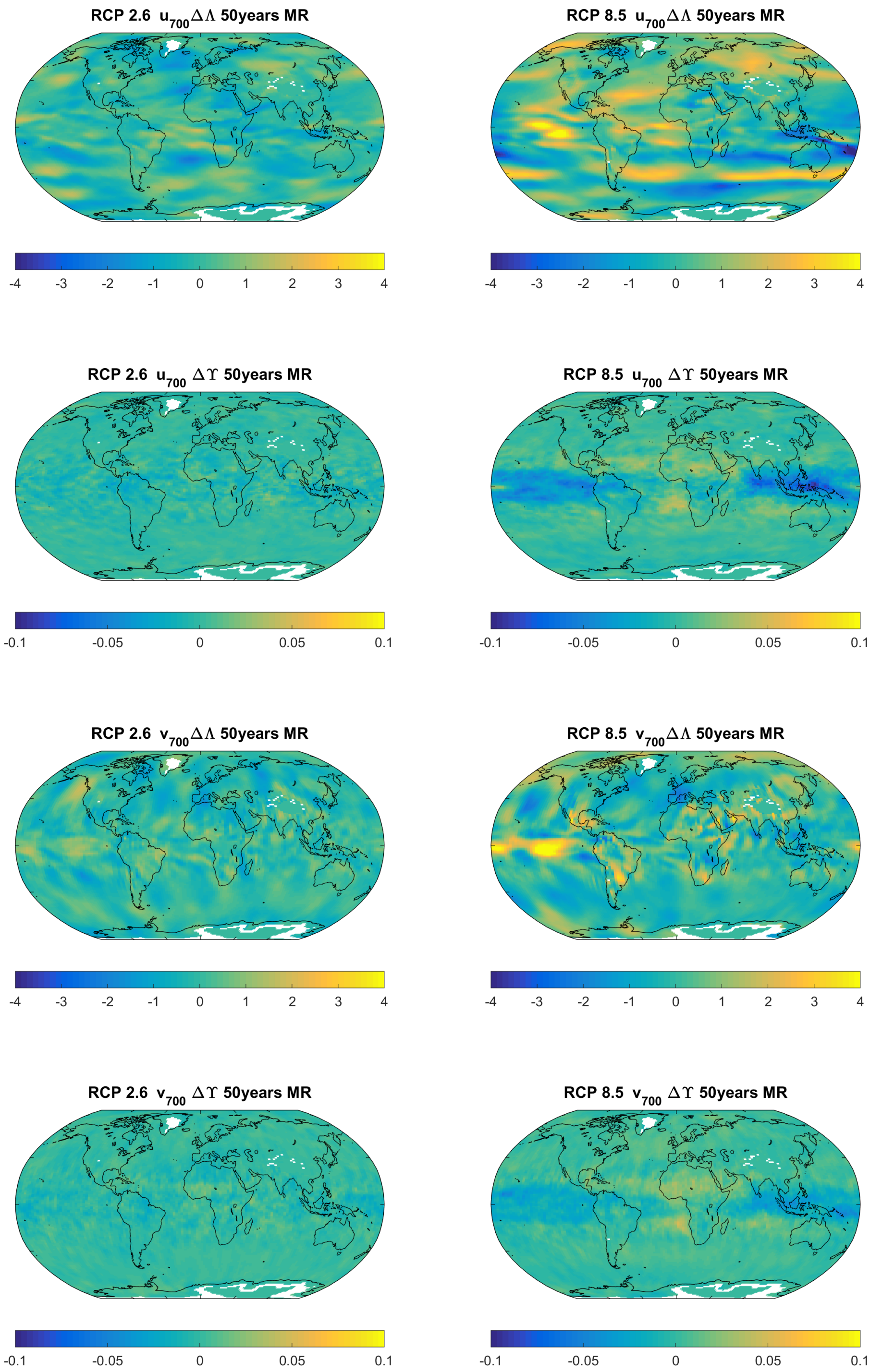

Figure 4. Medium resolution (MR) Differences in the integral of the autocorrelation function $\Delta\Lambda$ and in the spectral complexity $\Delta\Upsilon$ for the 50 year period.

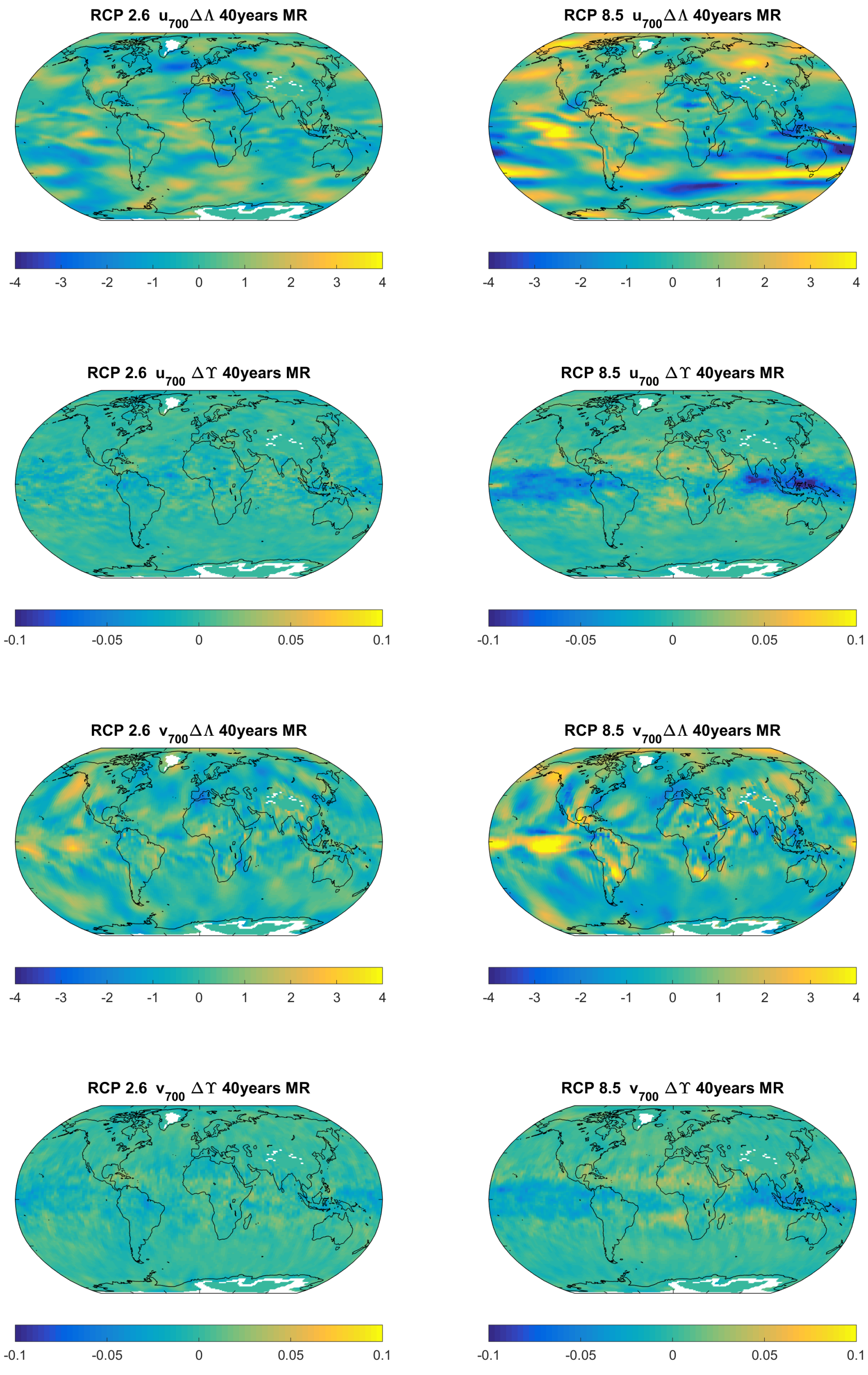

Figure 5. Medium resolution (MR) Differences in the integral of the autocorrelation function $\Delta\Lambda$ and in the spectral complexity $\Delta\Upsilon$ for the 40 year period.

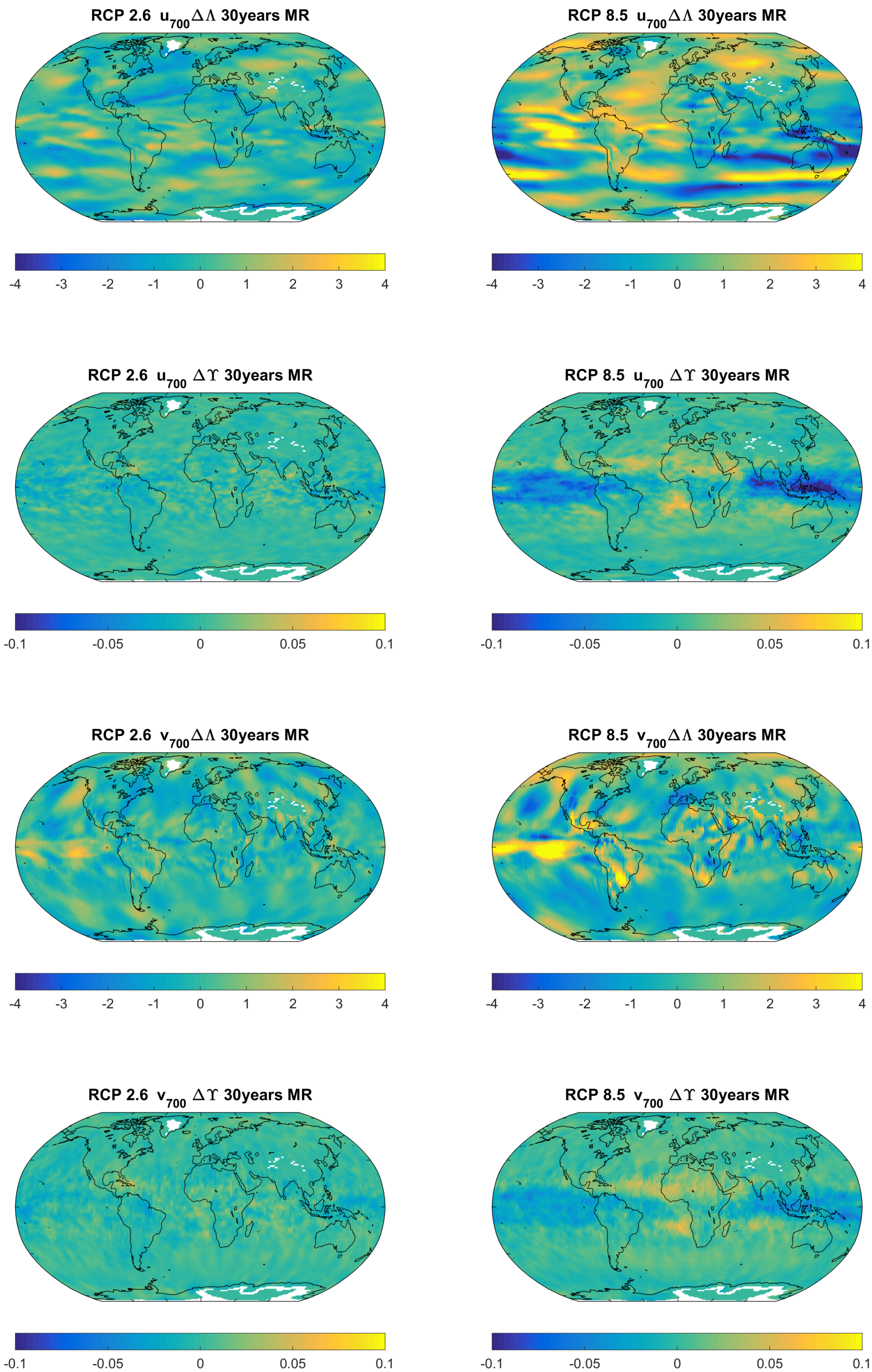

Figure 6. Medium resolution (MR) Differences in the integral of the autocorrelation function $\Delta\Lambda$ and in the spectral complexity $\Delta\Upsilon$ for the 30 year period.

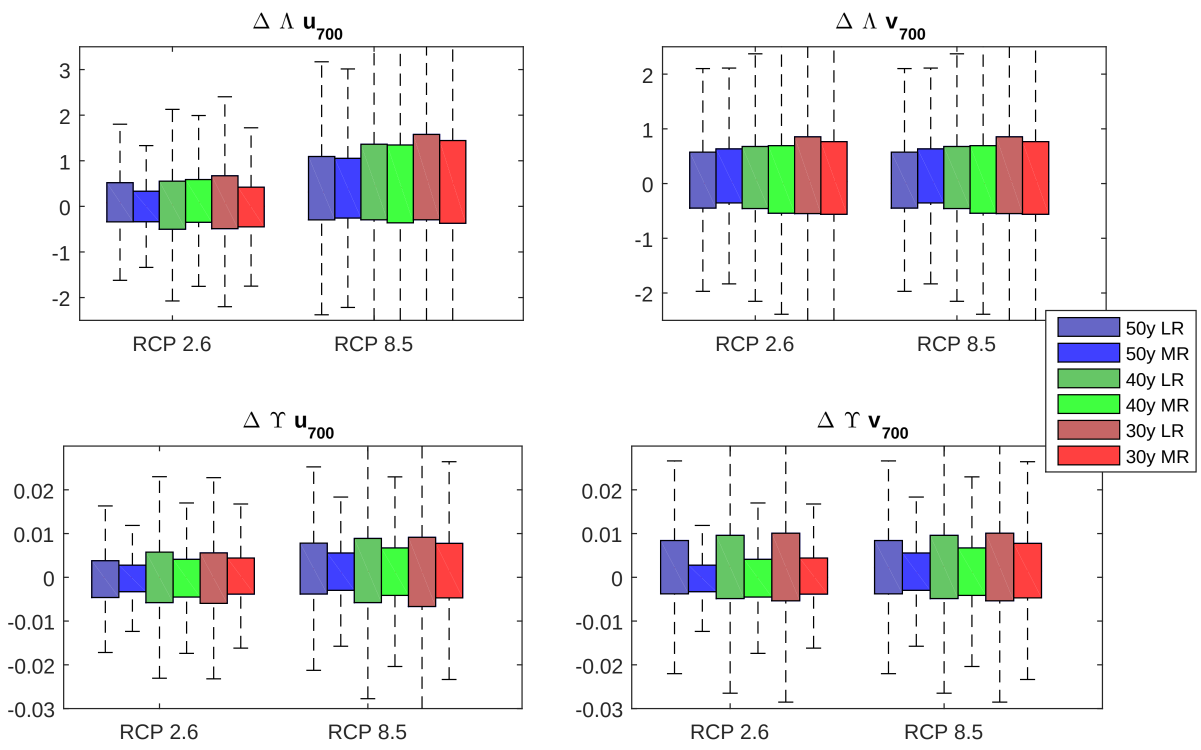

Figure 7. Boxplot resuming the tests of robustness performed at different resolutions/time intervals for the autocorrelation function $\Delta\Lambda$ and the spectral complexity $\Delta\Upsilon$. In each box, the central mark is the median, the edges of the box are the 25th and 75th percentiles, the whiskers extend to the most extreme data points not considered outliers.