

# Comparison of FI and the MCMESI for the Last Two Solar Cycles

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- H $\alpha$  flare index (FI) data are taken from Bogazici University Kandilli Observatory as daily values. The CME data are taken from SOHO/LASCO CME catalog and the maximum CME speed index are calculated as daily values. Then monthly values are produced.
- H $\alpha$  flare index (FI) data taken for the time period of January 1996– March 2018 (total 8127 days), which covers Cycle 23 completely and almost whole cycle 24 (2009-2018).
- The temporal variations of hemispheric and full disc FI data sets compared with the maximum CME speed index (MCMESI) data that arise under different physical conditions.
- Cross correlation analyses were applied to hemispheric and full disc FI and the MCMESI data sets.
- Periodic variations of hemispheric and full disc data were obtained by using the Morlet wavelet and MTM period analysis methods.
- Coherency of periodicities are obtained by applying the wavelet coherence analysis method.

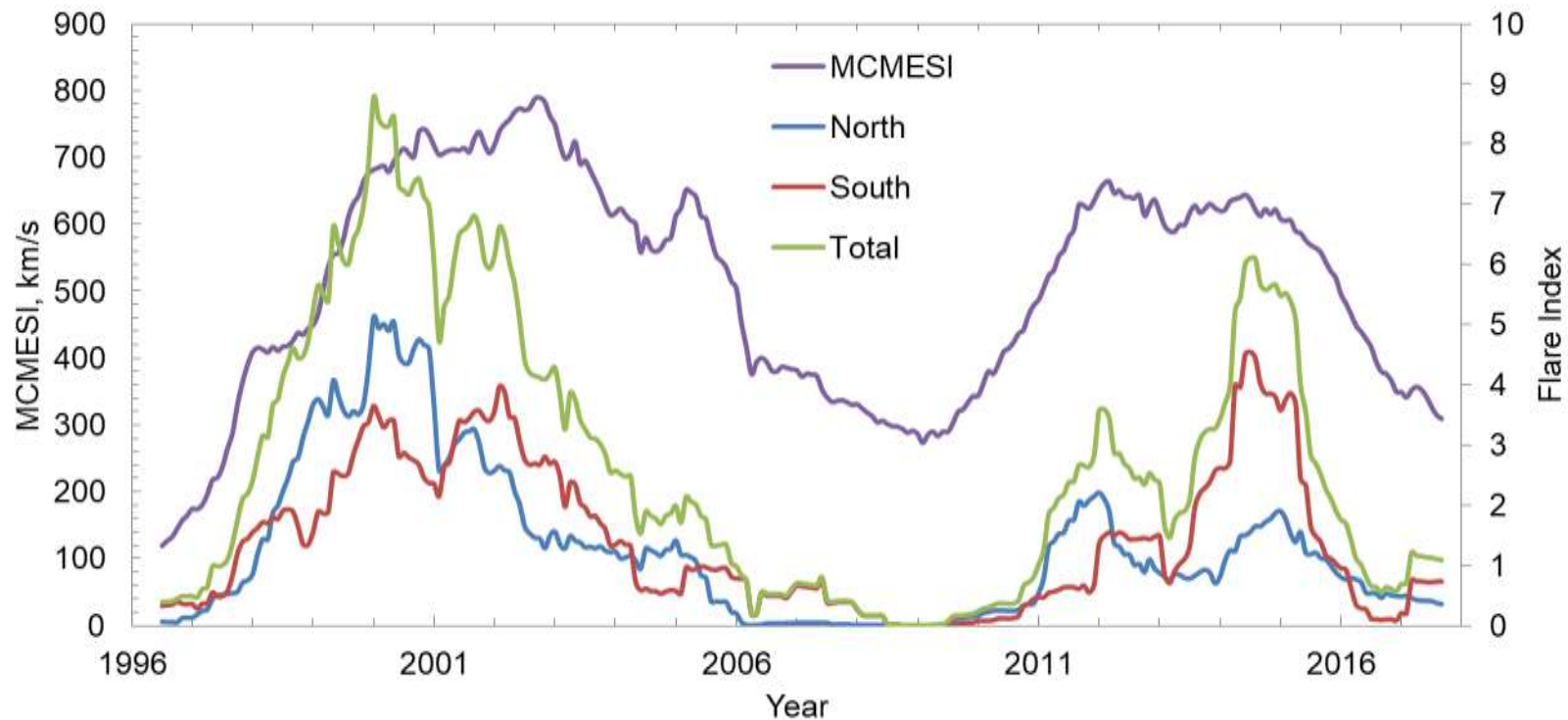


Figure 1. Temporal variations of the hemispheric and total flare index and the MCMESI.



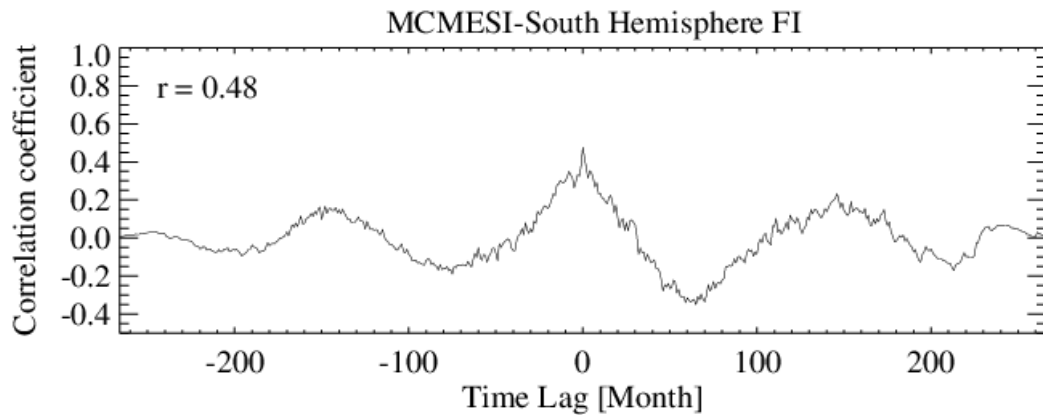
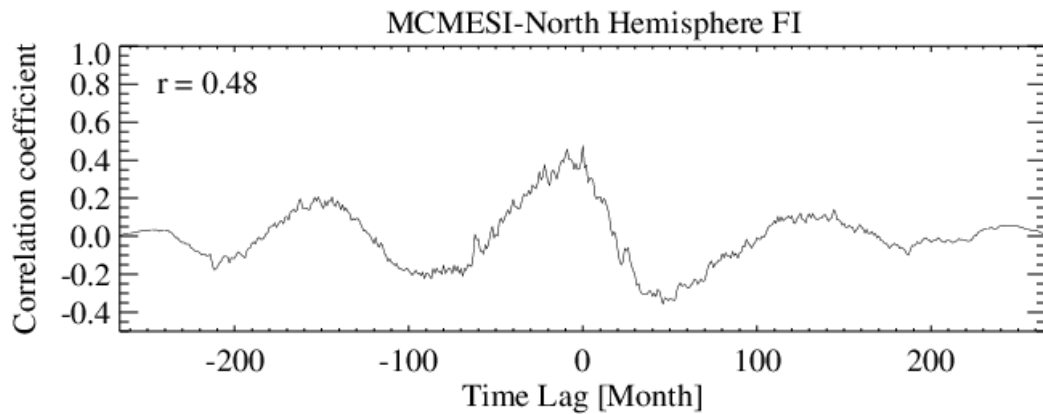
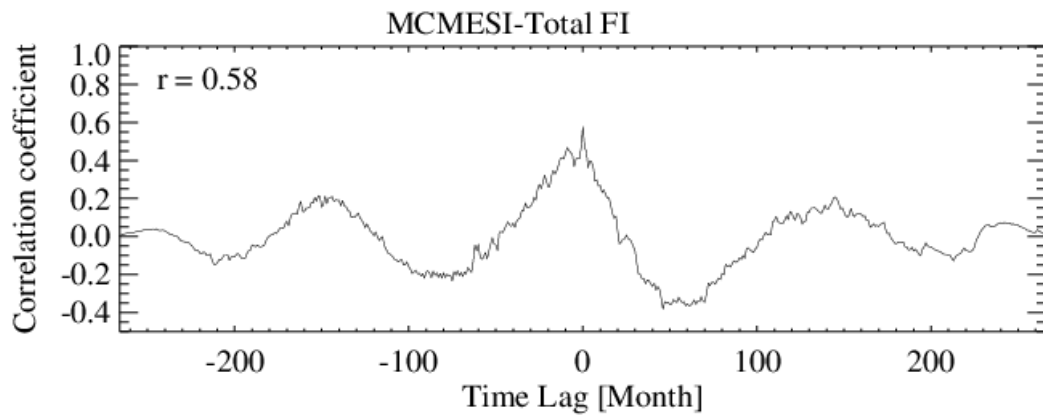


Figure 2. Cross correlation analysis results for the hemispheric and full disc FI

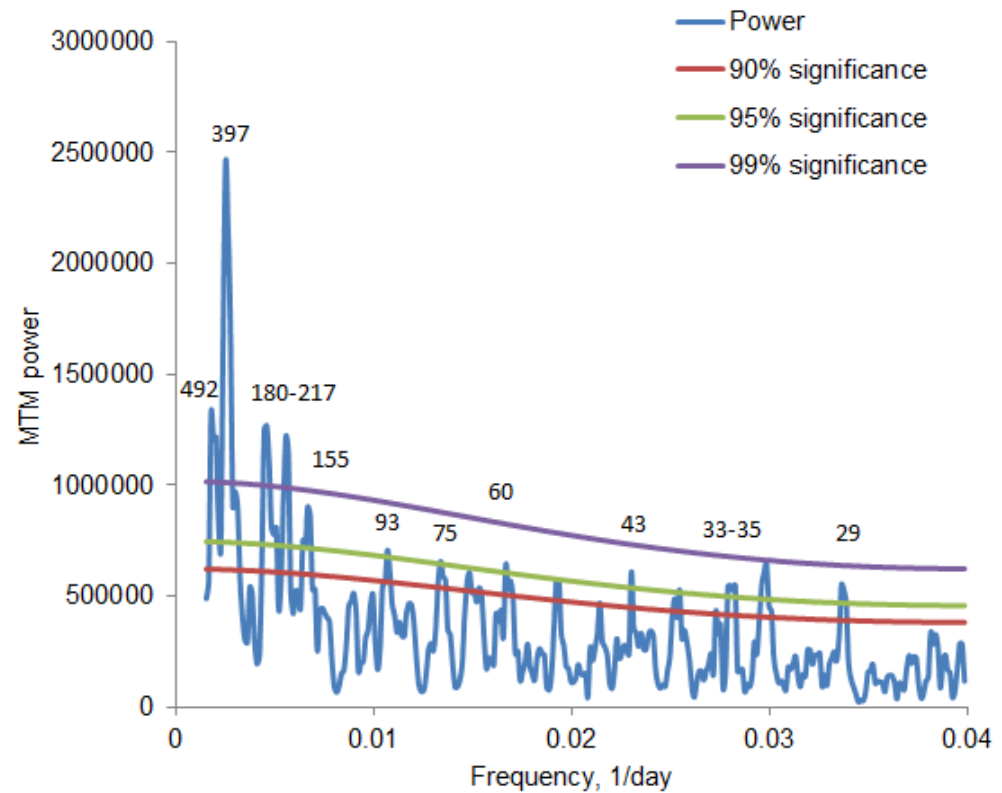
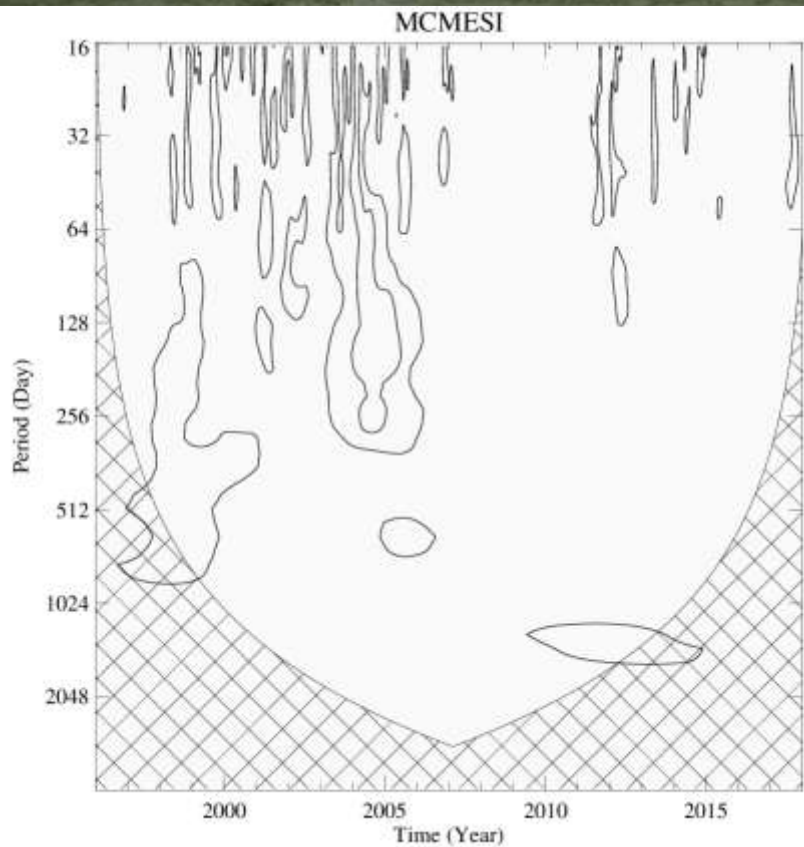


Figure 3. Wavelet (left panel) and MTM (right panel) period analysis results for the MCMESI during the investigated time period (1996-2018).

North Hemisphere FI

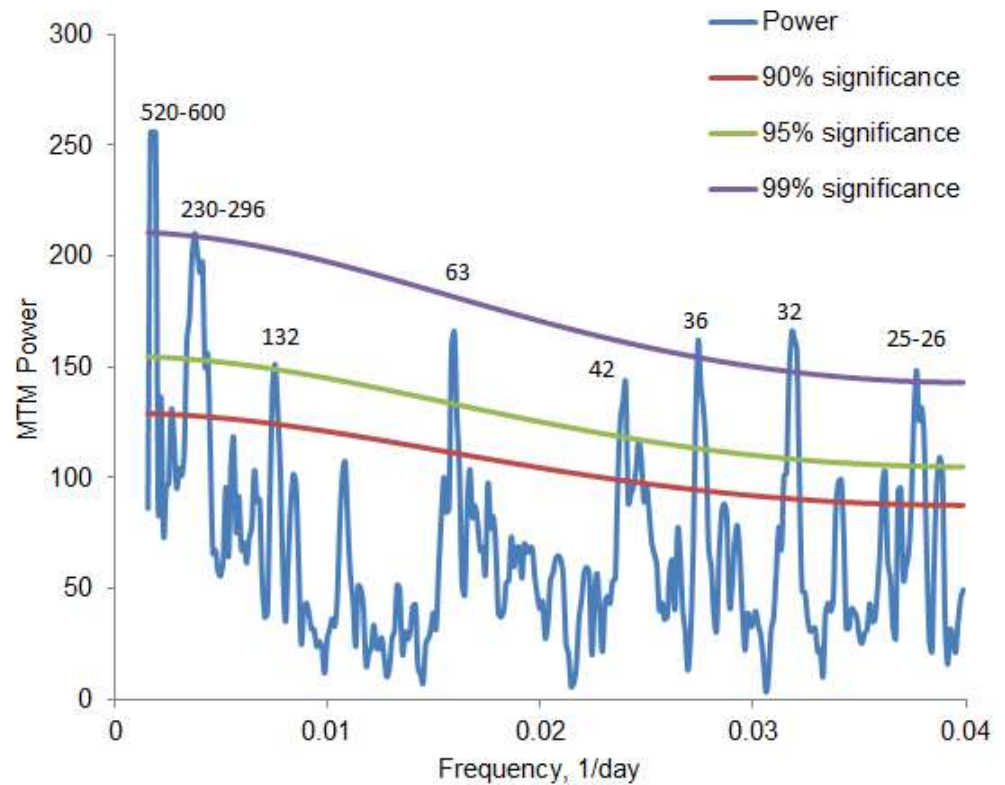
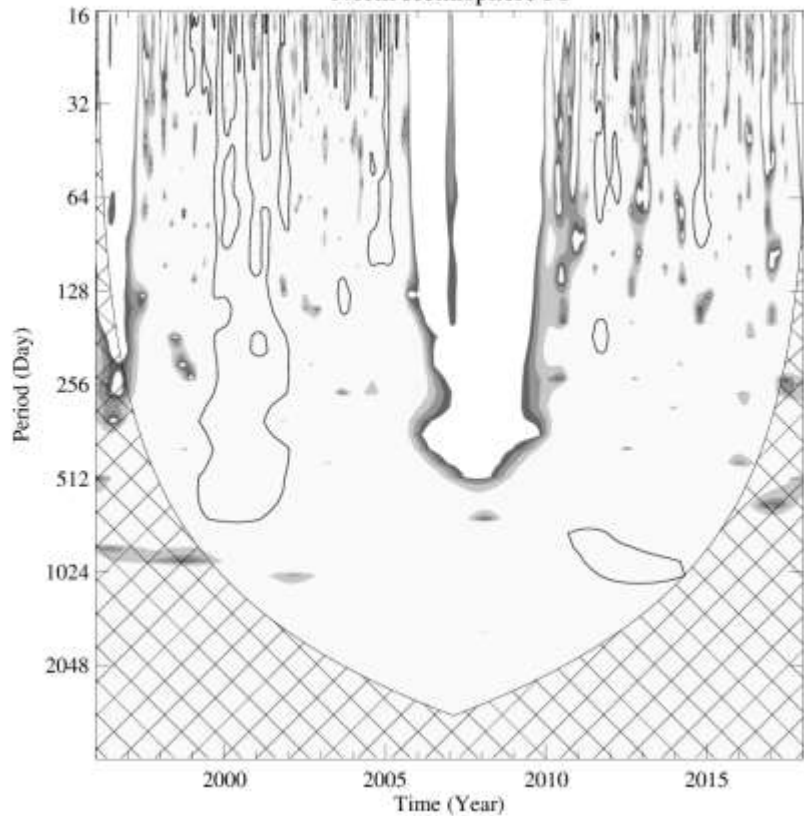


Figure 4. Wavelet (left panel) and MTM (right panel) period analysis results for North hemisphere FI data during the investigated time period (1996-2018).



South Hemisphere FI

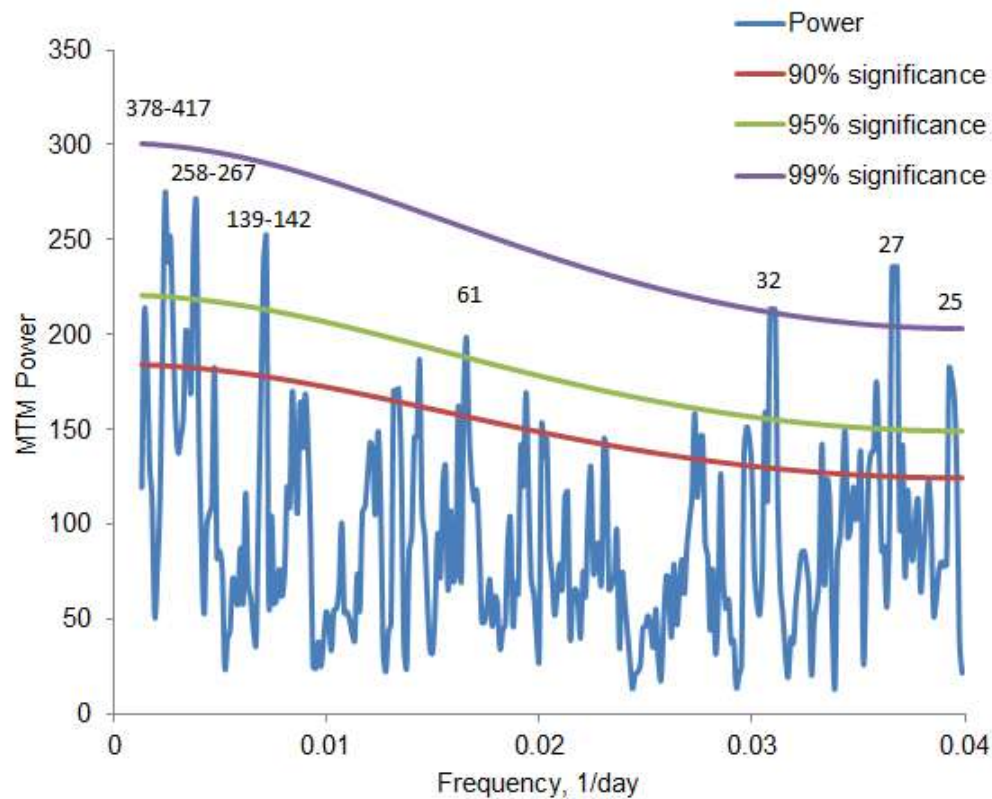
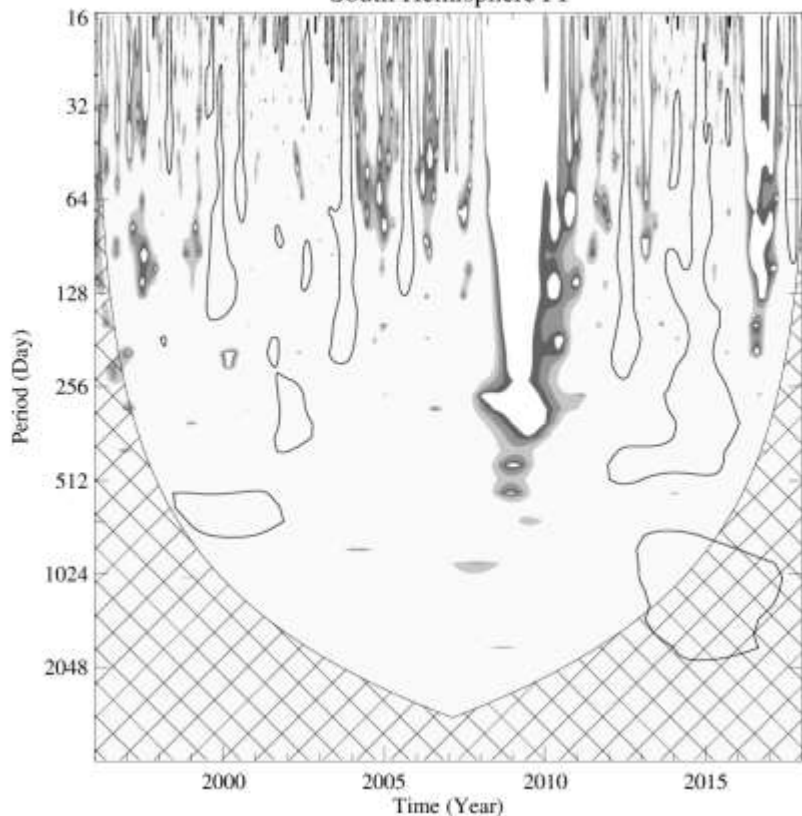


Figure 5. Wavelet (left panel) and MTM (right panel) period analysis results for South hemisphere FI data during the investigated time period (1996-2018).

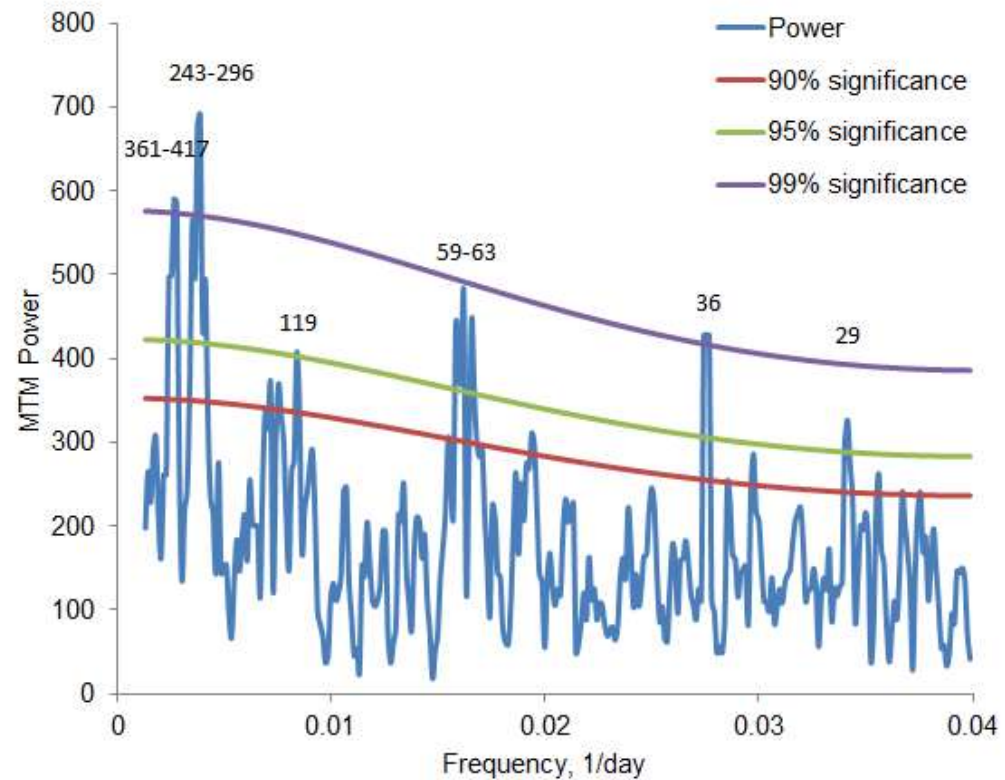
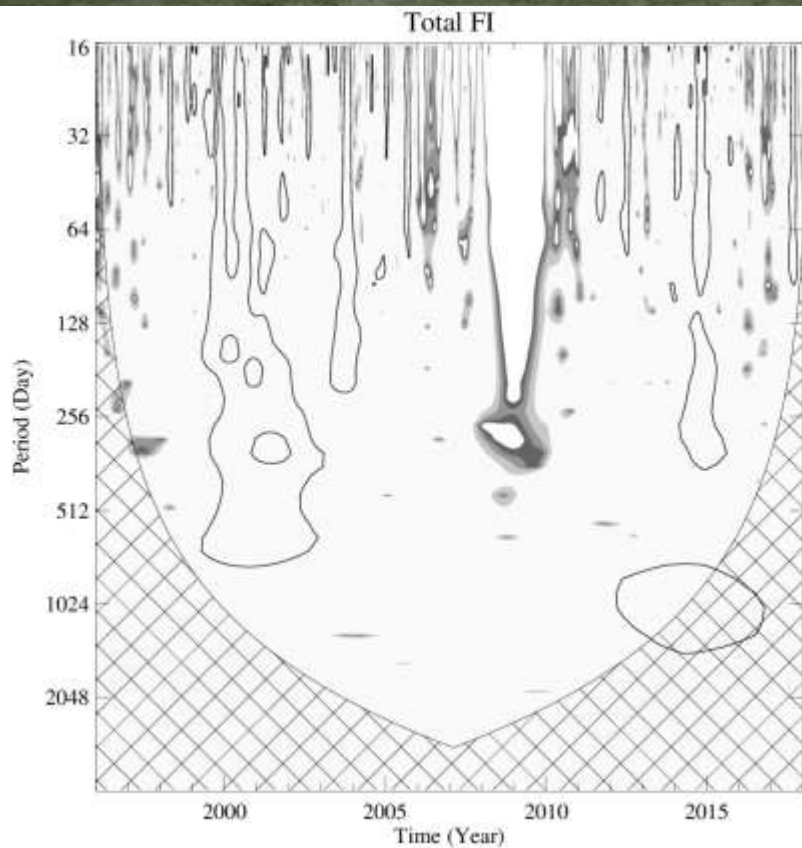


Figure 6. Wavelet (left panel) and MTM (right panel) period analysis results for full disc FI data during the investigated time period (1996-2018).



## Wavelet Coherence: FI North - MCMESI

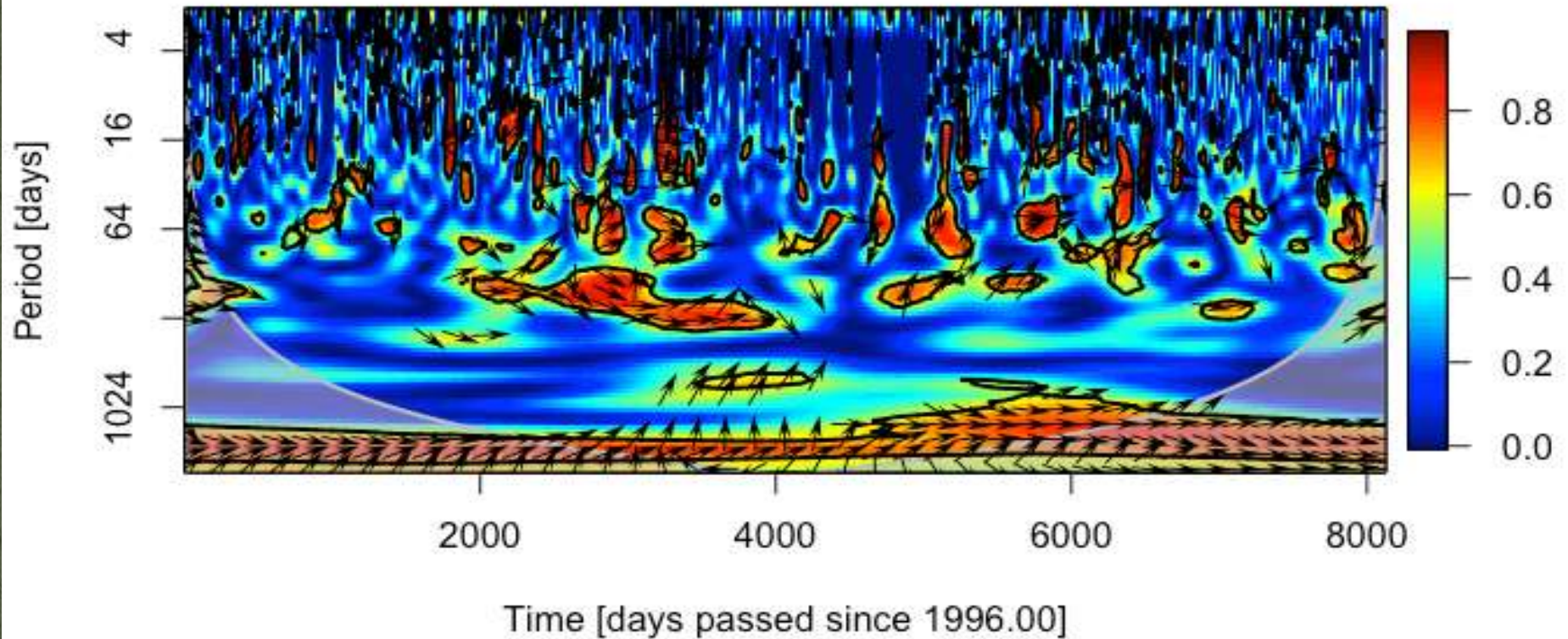


Figure 7. Wavelet coherence of North hemisphere FI versus the MCMESI data during the investigated time period (1996-2018).

## Wavelet Coherence: FI South - MCMESI

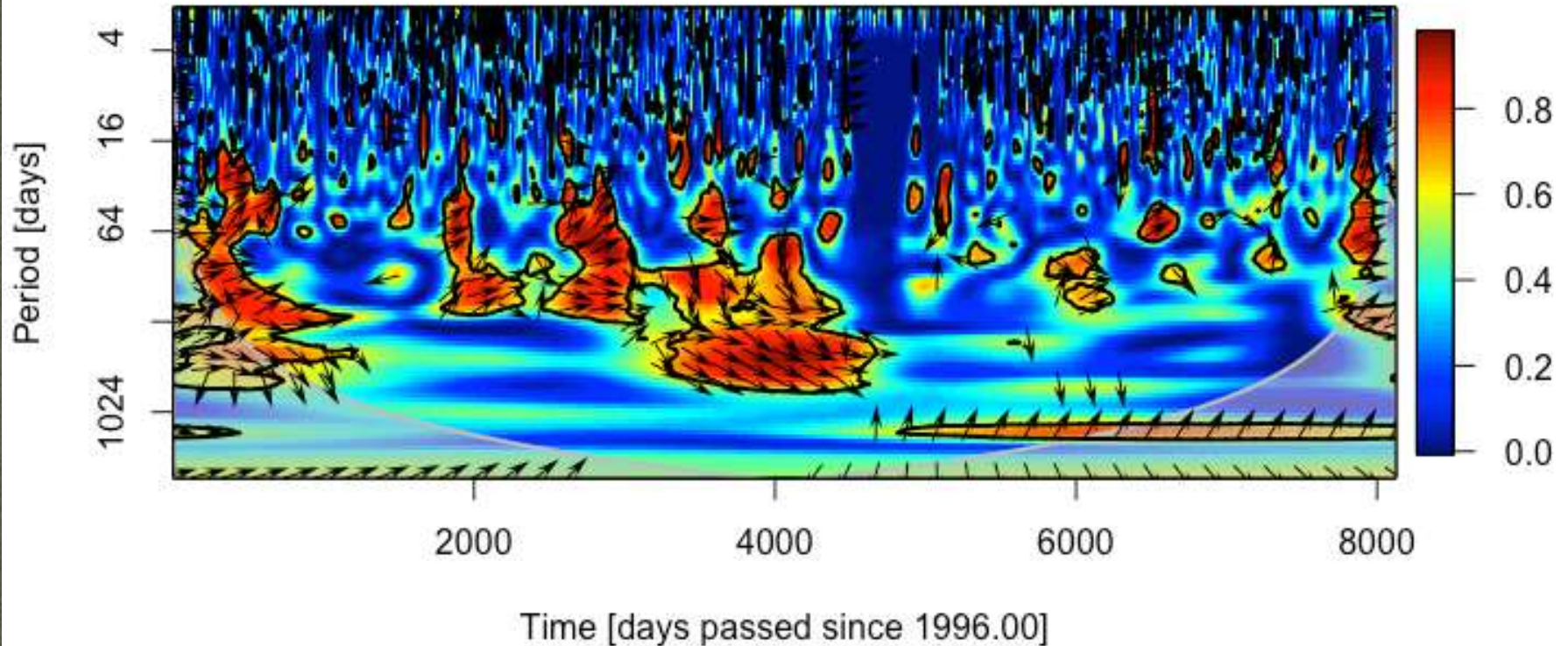


Figure 8. Wavelet coherence of South hemisphere FI versus the MCMESI data during the investigated time period (1996-2018).



## Wavelet Coherence: FI Total - MCMESI

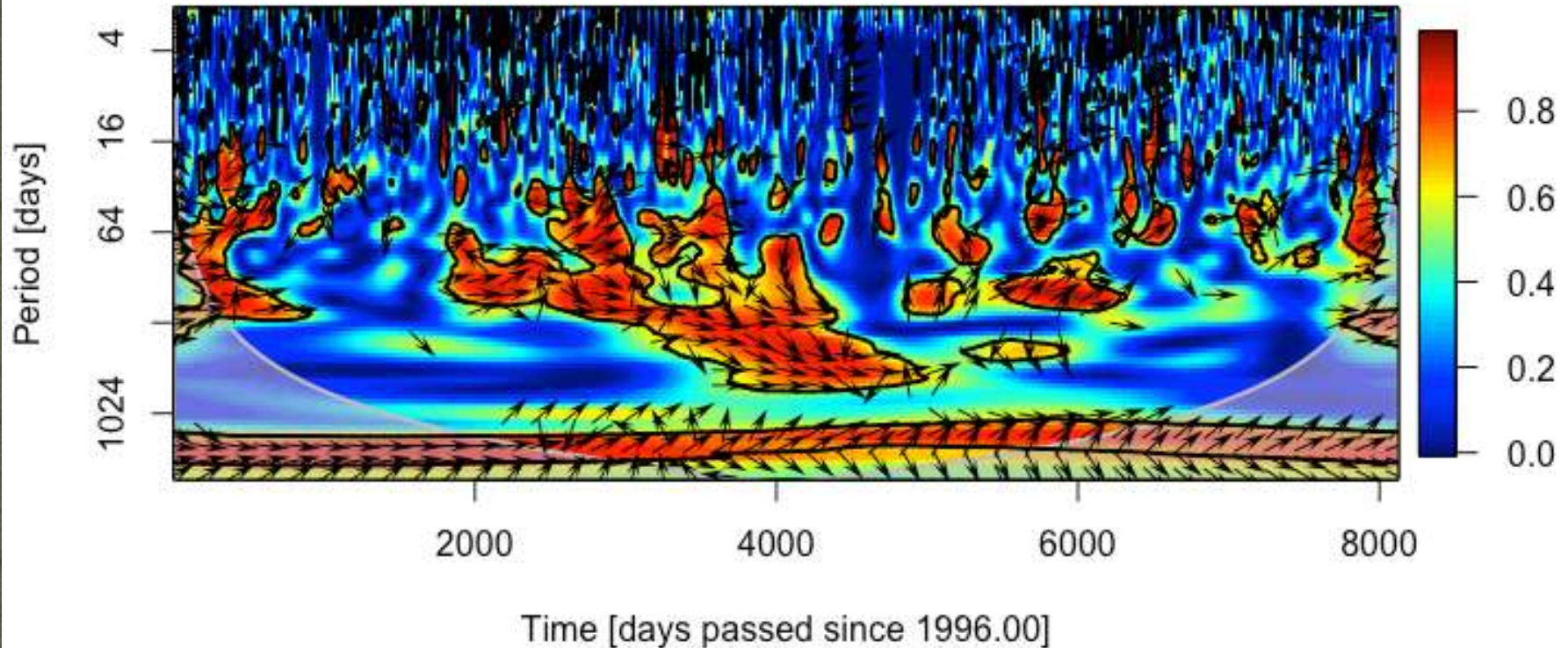


Figure 9. Wavelet coherence of full disc FI versus the MCMESI data during the investigated time period (1996-2018).



- The temporal behavior of North and South hemisphere FI data show different variations during the investigated time period.
- Both north and south hemisphere FI data show the same level of correlation ( $r = 0.48$ ) which is lower than the total FI data ( $r = 0.58$ ) with the MCMESI.
- Hemispheric FI data sets also show some cyclic differences in both wavelet and MTM periodicity analysis.
- The wavelet coherence analysis also reveal some differences between hemispheric data sets.

THANKS FOR YOUR ATTENTION

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