THE SUMMER MONSOONS IN THE 11-YEAR SUNSPOT PEAKS

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Left: 20-mb heights correlated with the solar index in December. Right: The same for August.
Summer, No. Hem.: 77% of the interannual variance.
Summer, So. Hem.: 72%
A NOAA website for sunspot data

v/STP/SOLAR_DATA/SUNSPOT_NUMBERS/INTERNATIONAL/max
min/MAXMIN
1. The Australian-Indonesian Summer Monsoon - December-January

van Loon, 2012: ISRN Meteorology, 1-5.
Sea-level pressure anomalies in left: the last seven sunspot peaks, right: the first eight sunspot peaks. Dec.-Jan.
Left: The sea-surface temperature anomalies in the first eight sunspot peaks. Right: In the last seven peaks. December-January
Long-term mean sea-surface temperature
Enhancement of the mean
The combined sea-surface temperature anomalies in 15 sunspot peaks, in December-January
December-January, all 15 sunspot peaks
Close-Up: Sea-level pressure anomalies in 15 sunspot peaks, December-January
Left: Average Precipitation Rate, December-January, 1949-2012
Right: Anomalies in Six Recent Sunspot Peaks
Average 100-mb Tropical Temperature. Dec.-Jan. 1949-2012
100-mb temperature anomalies, Dec-Jan., in six recent sunspot peaks.
Left: Mean zonal wind, DJ 1949-2012
Right: Anomalies, D-J, in six sunspot peaks.
Summary (so far)

• The effect of the sunspot peaks is that tropical convection in the northern winter is enhanced and mostly so in the area of the Australian-Indonesian monsoon: Northern Australia, Indonesia, and the Pacific warm pool. The air rises in the monsoon, creating a cold and high tropopause and outflow of air to the Pacific Ocean, where it sinks.

• Thus a stronger than normal dry zone is created, the rising branches of the Hadley circulation are displaced polewards, and the Walker Circulation extends westwards (van Loon, ISRN Meteorology, 2012, van Loon and Meehl, 2007, 2008)).

• I stress: It is not an extreme but an enhancement of the long term mean.
Pressure anomalies in 15 sunspot peaks
July August
Left: Pressure anomalies in the first eight sunspot peaks
Right: Pressure anomalies in the last seven sunspot peaks

July-August
Left: Mean rainfall rate, July-August, 1949-2011
Right: Rainfall rate anomalies in six sunspot peaks.
Enhancement of the long-term mean rainfall.
Left: Mean vertical motion, 1949-2011, July-August
Right: Anomalies in six sunspot peaks.
Again: An enhancement of the long-term mean
Left: Mean vector wind, July-August, 1949-2011
Right: Wind anomalies in six sunspot peaks
Left: Average SST July-August 1948-2012
Right: SLP anomalies in 15 sunspot peaks, July-August.
SST anomalies in 15 sunspot peaks June-August
Left: Mean temperature anomaly in 6 sunspot peaks, June-August. Right: The same in December-February
SUMMARY

• In the 15 sunspot peaks since the one in 1860, for which sea-level data are available, the convection in summer in the tropics, especially in the monsoons, rose in the mean to higher levels than normal, and dropped to lower levels than normal over the tropical Pacific.

• The effect on the global temperature in the troposphere was minimal, perhaps it was negative. This is in contrast to the trends in insolation.