



## **Is activity in one hemisphere enough to maintain the magnetic cycle?**

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Sunspot activity is often hemispherically asymmetric, and during the Maunder minimum activity was almost completely limited to one hemisphere. We use surface flux simulations to study how magnetic activity limited only to the southern hemisphere affects the long-term evolution of the photospheric magnetic field in both hemispheres. The key question is whether activity in one hemisphere is enough to maintain the magnetic cycle of polar areas in both hemispheres.

We simulate the evolution of the field from 1978 to 2016 using the observed active regions of the southern hemisphere as input. We study the flow of magnetic flux across the equator and its subsequent motion towards the northern pole.

We find that activity in the southern hemisphere is enough to maintain the magnetic cycle in both hemispheres by the cross-equatorial flow of magnetic flux. About one percent of the flux emerging in the southern hemisphere is transported across the equator, but only 0.1%-0.2% reaches high latitudes to reverse and regenerate a weak polar field in the northern hemisphere. The magnetic cycle of the northern hemisphere is delayed compared to the southern hemisphere, leading to a quadrupole Sun lasting for several years.