

Solar internal circulation system





Overview

What is solar meridional circulation?

Solar meridional circulation is an axisymmetric flow system, extending from the equator to the poles (~ 20 m/s at the surface, $\approx 1\%$ of the mean solar rotation rate), plunging inwards and subsequently completing the circuit in the interior through an equatorward return flow and a radially outward flow back up to the surface.

How does helioseismology study the solar interior?

Helioseismology (Christensen-Dalsgaard 2002; Gizon and Birch 2005) is the only means by which to study the solar interior. Acoustic oscillations, excited by vigorous turbulent convection in the near-surface layers, propagate within the solar interior, setting up resonances at discrete frequencies and wavenumbers.

What is the progression of a solar cycle?

The cycle has a very well defined progression, with sunspots erupting at latitudes of around (30°) at the start of the cycle (immediately following the preceding minimum), and emerging at lower latitudes with the evolution of the cycle. By the end the cycle, new field appears very close to the equator. 5.

Is solar thermal convection a stationary process?

Solar thermal convection is a statistically stationary process, although the magnetic cycle is capable of modulating it, especially in the surface layers.



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Solar Interior

The solar interior refers to the physical structure of the Sun, characterized by theoretical models that describe its temperature, pressure, and density, as well as the processes involved in ...

Surface and interior meridional circulation in the Sun

Jan 9, 2023 · Abstract Solar meridional circulation is an axisymmetric flow system, extending from the equator to the poles (20 m/s at the surface, 1% of the mean solar rotation rate), plunging ...

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Dynamics of Large-Scale Solar Flows , Space Science Reviews

Nov 17, 2023 · The Sun's axisymmetric large-scale flows, differential rotation and meridional circulation, are thought to be maintained by the influence of rotation on the thermal-convective ...

Assessing the Observability of Deep Meridional Flow Cells in the Solar

Jan 16, 2024 · When using helioseismology to study the meridional circulation in the solar interior, the final product is an estimate of the flow velocity at many positions of interest in latitude and ...

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Sep 5, 2017 · Because of the vertical stratification and horizontally nonuniform distribution of the magnetic field and heating, one circulation cell is formed in each of the upper and lower ...

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Structure and Dynamics of the Sun's Interior Revealed by the



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