SOLAR ROSSBY WAVES

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WHAT IS A ROSSBY WAVE?
**Some Equations**

\[ \beta = \frac{\partial f}{\partial y} = \frac{1}{a} \frac{d}{d\phi} (2\omega \sin \phi) = \frac{2\omega \cos \phi}{a} \]

Φ is latitude, ω is angular rotation speed of the Earth, a is the mean radius of the Earth, and f is the planet’s vorticity as a function of latitude (subject to some perturbation)

**The Rossby Parameter**

If \( \beta = 0 \) there is NO Rossby wave
**Solar vs. Planetary Wave**

<table>
<thead>
<tr>
<th>Solar</th>
<th>Earth</th>
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<tbody>
<tr>
<td>- Origin as of yet unknown.</td>
<td>- Results from the Coriolis effect due to rotation of the Earth.</td>
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<td>- Could be result of rotation of the sun, magnetic fields, other</td>
<td>- Emerge due to sheering of fluid/air in the atmosphere and ocean.</td>
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<td>factors.</td>
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<td>- Most likely a deep rooted phenomenon.</td>
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<td>- Could be in different layers (some clusters move in opposite</td>
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<td>directions!)</td>
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DETECTING ROSSBY WAVES: BRIGHT POINTS

- ~2-5 Mm
- Zones of intense EUV/X-ray radiation
- Clusters found mostly below ±55° latitude
STEREO A+B & AIA
MAKING SENSE OF THE DATA
SLICING THE DATA

AIA

STEREO A

STEREO B
ACCOUNTING FOR THE B-ANGLE

- B-angle is result of tilt of satellite to sun’s axis.
- If B-angle is not properly subtracted, wave behavior could be an artifact of this.
BP Clusters
Cluster Statistics

![Graphs showing statistical distributions related to cluster activity.](image-url)
FULL DATA CUBE

[Diagram showing a 3D plot with Carrington Latitude and Longitude axes, and a label indicating 'Totalled cube in the z']
LATITUDE SLICES
HOVMÖLLER DIAGRAMS

Generation of eddy kinetic energy on Earth

“Arguably, one of the best methods to identify RWTs on weather maps is pattern recognition by the human brain”.

Source: Glatt et. al. *Tellus* 2011
ROSSBY WAVE EVIDENCE
LONGITUDE SLICE
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