Introductory Astronomy

Week 4: Stars

Clip 6: Solar Weather

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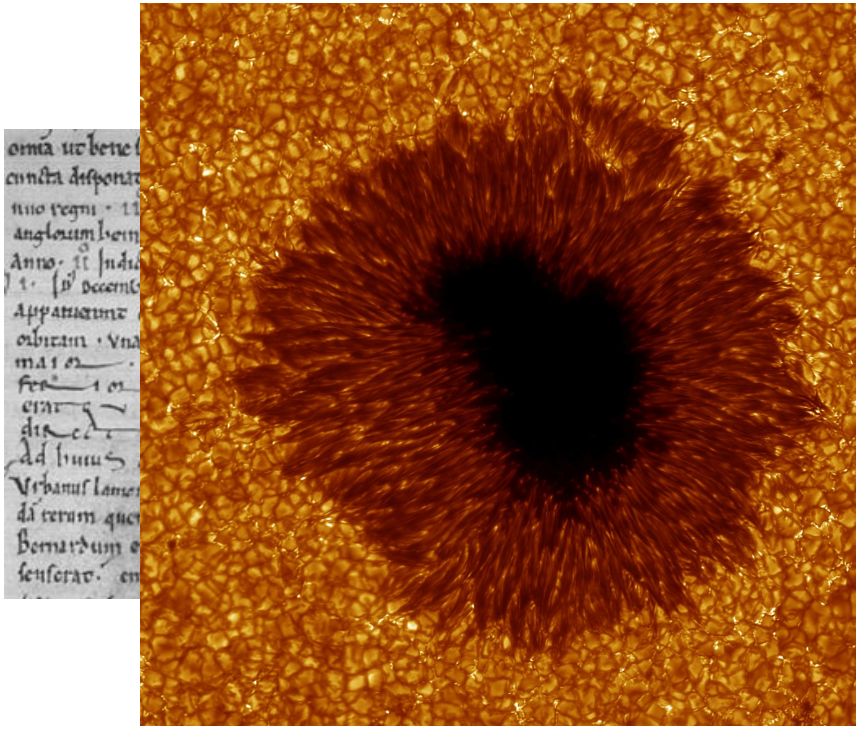
Blemishes

- First recorded Gan De 364BC
- Galileo used them to find rotation period 25.4d
- Dark because cooler 4000K
- Wilson 1769: depressions in photosphere



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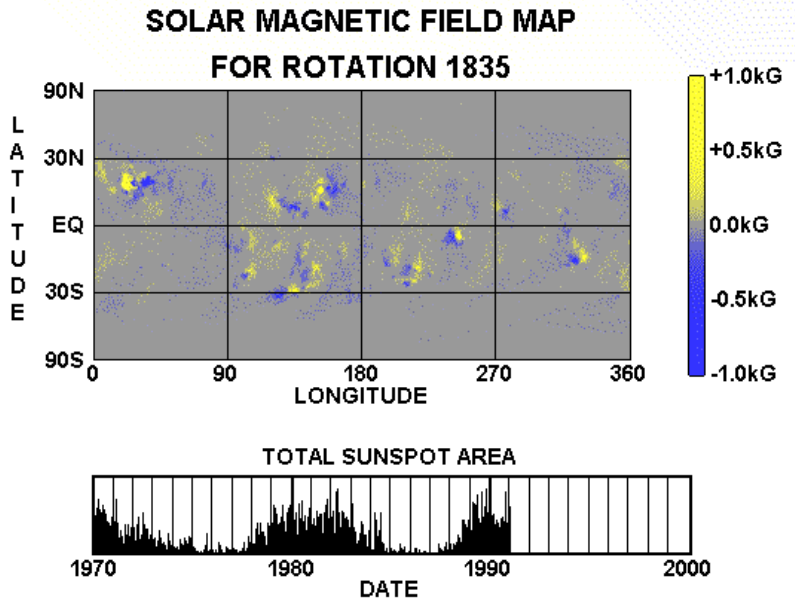
Patterns

- Sunspot number varies in 11y cycle
- Sunspot pairs appear first at mid-latitudes and later near equator
- Spots are regions of increased magnetic field choking convection
- Pair polarity consistent in hemisphere/cycle reverses between cycles



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Solar Magnetism

- Solar field not simple dipole
- Differential rotation of charged plasma deforms field in convection zone
- High fields at surface produce reconnection events
- Reconnection releases energy in field, reverses polarity every 11y

Magnetic Storms

- Reconnection releases magnetic energy accelerating charged particles
- Sudden release of up to $6 \times 10^{25}\ \mathrm{J}$ in flare heats gas to $10^{7}\ \mathrm{K}$
- More violent: Prominences, Coronal Mass Ejections
- Cause geomagnetic storms

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Credits

- Solar Dynamo Movie: SOHO (ESA & NASA) http://sohowww.nascom.nasa.gov/bestofsoho/Movies/dynamo/ http://
- Sunspots: P. Saltzberger http://www.salzgeber.at/astro/index.html
- Sunspot: Dan Kiselman, Mats Löfdahl, ISP/Royal Swedish Academy of Sciences http://www.solarphysics.kva.se/
- Solar Flare: NASA/SDO/AIA http://www.nasa.gov/mission_pages/sunearth/news/News030712-X5-4.html
- CME: NASA/SDO http://www.nasa.gov/multimedia/videogallery/index.html?collection_id=15505&media_id=156264571

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