Significance of TSI Measurements 1974 to 2010

Cycle 23-24 Minimum and The Maunder Minimum
1975

- Fröhlich 1373 20 W/m^2
- Willson and Hickey 1370 2 W/m^2
- Smith and Gottlieb 1358 W/m^2

- (The Solar Output and Its Variation 1977)
TSI Measurements 1978 to 2008
(courtesy of Dr. Schmutz)
Composite TSI
(Courtesy of Dr. Schmutz)
Cycle 23-24 Minimum Epoch

F10.7

MgII Index

TSI
### Cycle 23-24 Minimum Epoch

TSI, F10.7, and MgII Index Values at Minimum

<table>
<thead>
<tr>
<th>Irradiance</th>
<th>Begin</th>
<th>End</th>
<th>Duration days</th>
<th>Average Irradiance</th>
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<tbody>
<tr>
<td>TSI</td>
<td>10/01/2008</td>
<td>5/01/2009</td>
<td>212</td>
<td>1360.85 W/m^2</td>
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<tr>
<td>F10.7</td>
<td>11/01/2008</td>
<td>5/01/2009</td>
<td>181</td>
<td>67.5 sfu</td>
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<tr>
<td>MgII Index</td>
<td>12/01/2008</td>
<td>5/01/2009</td>
<td>151</td>
<td>0.266</td>
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Mini Maunder Minimum

Sunspot Observations
in
The Cycle 23-24 Minimum
Helevius Observations 1644

May

August, September, October
Sunspot Latitude Distribution
1660 to 1720
(Ribes and Ribes, 1993)
MDI White Light Image
May 14, 2010
NSO SOLIS Magnetogram
May 14, 2010

Preliminary
Umbral Intensity vs Magnetic Field Strength

(Livingston and Penn 2010)
Scheiner’s Helioscopium
McMath Pierce Telescope Image
Bill’s assistant: Jane Pauley, NBC
White Light Sunspot Image
30 Mar 2010  Mayall-Pierce west auxiliary telescope
(W.C. Livingston)
Maunder Minimum Conjecture

Since cosmic ray modulation continued through the MM, solar activity was present at some level.

Surface activity was limited to pores with weak magnetic fields.
Discussion

17th century telescopes had sufficient aperture and optical quality for detection of sunspots.

One objective of the Paris Obs. Program was measurement of the solar diameter.

Solar measurements were, therefore, made at local noon in Paris.

Low contrast pores could not be seen in projected images because of poor “seeing” in the city.

Sunspots were again seen as soon as their size and contrast increased late in the 17th century.