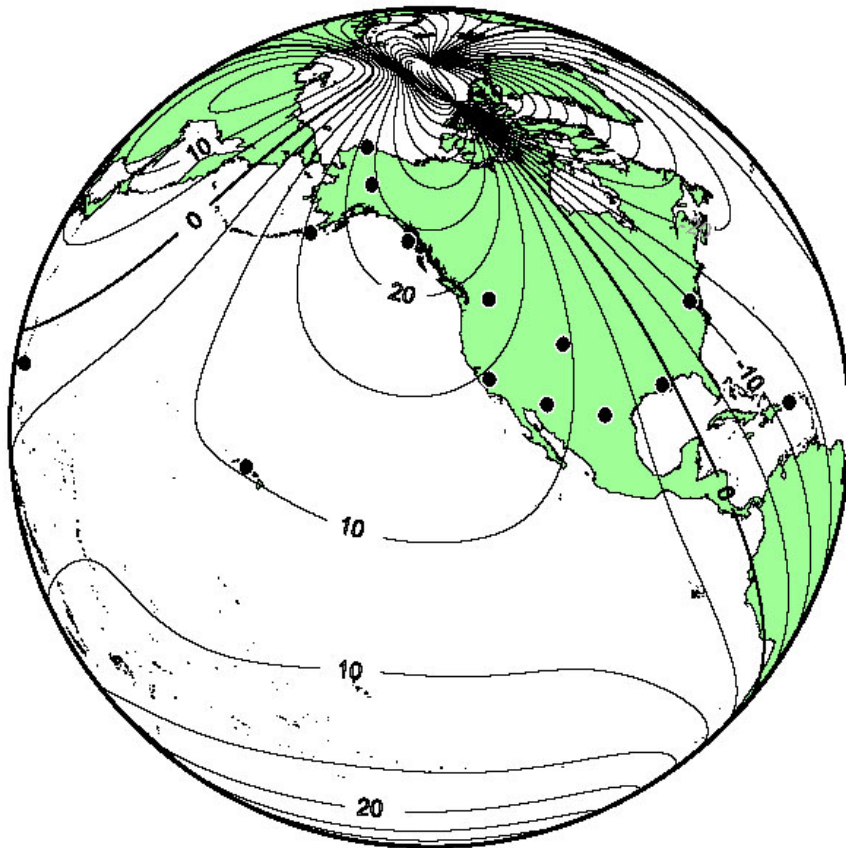


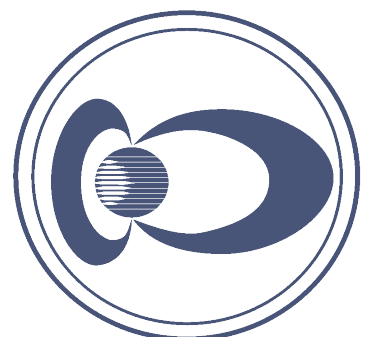
# A Continuous Long-Term Record of Magnetic-Storm Occurrence and Intensity



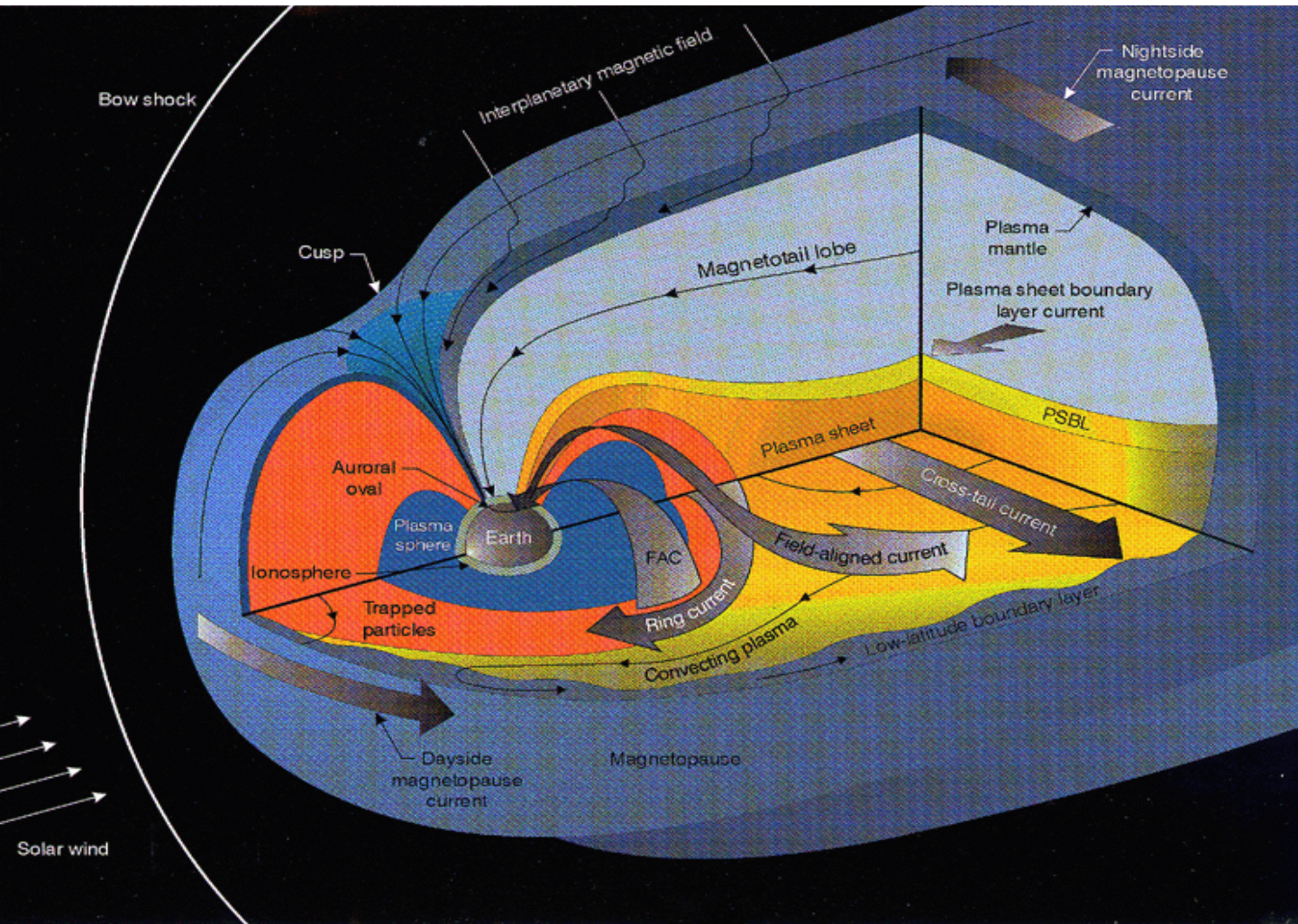
Jeffrey J. Love

USGS Geomagnetism Program

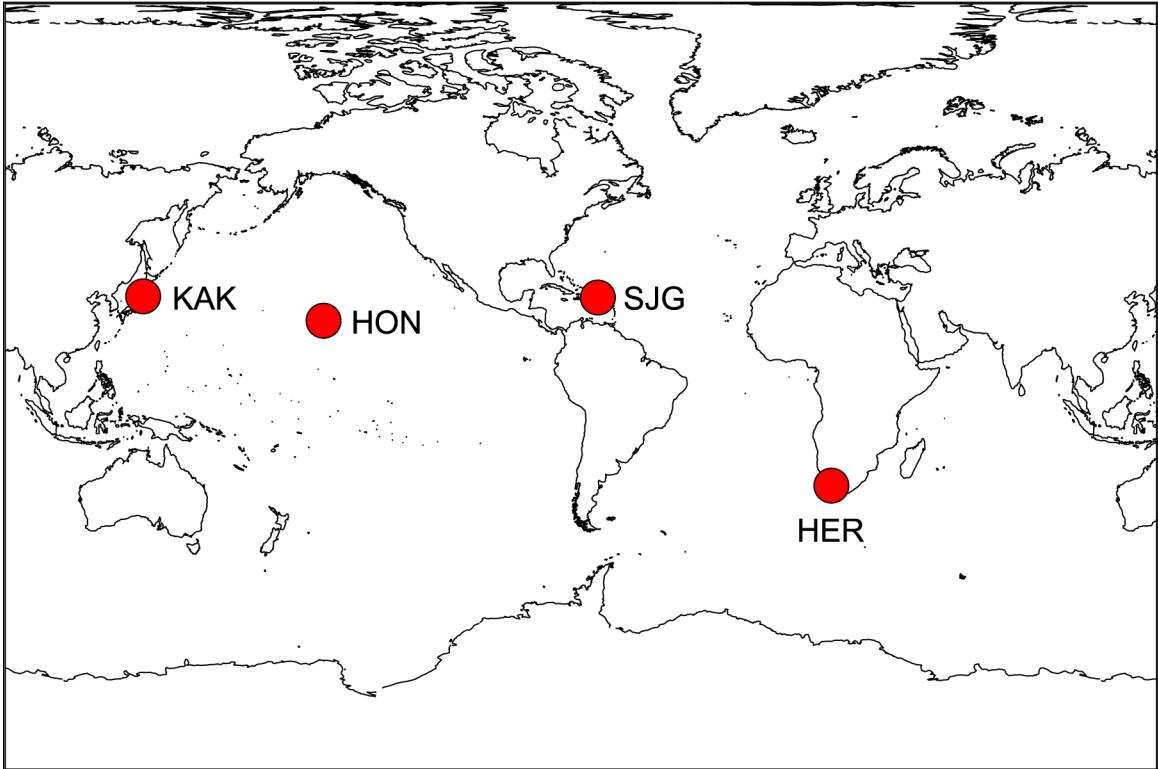
<http://geomag.usgs.gov>



# Equatorial Ring Current and Dst



Measurements made near the Earth's equator of the disturbance of the horizontal magnetic field made during magnetic storms can be represented by an equivalent magnetospheric ring current in the magnetosphere. The longitudinal average of these measurements is the Dst index, a fundamental measure of magnetic-storm intensity.



HER Hermanus South Africa  
KAK Kakioka Japan  
HON Honolulu United States  
SJG San Juan Puerto Rico

Observatory distribution is not ideal and it doesn't exploit the many additional observatories that are available.

Dst service provided by Kyoto WDC

USGS is planning on providing its own Dst service, with additional Dst-related services

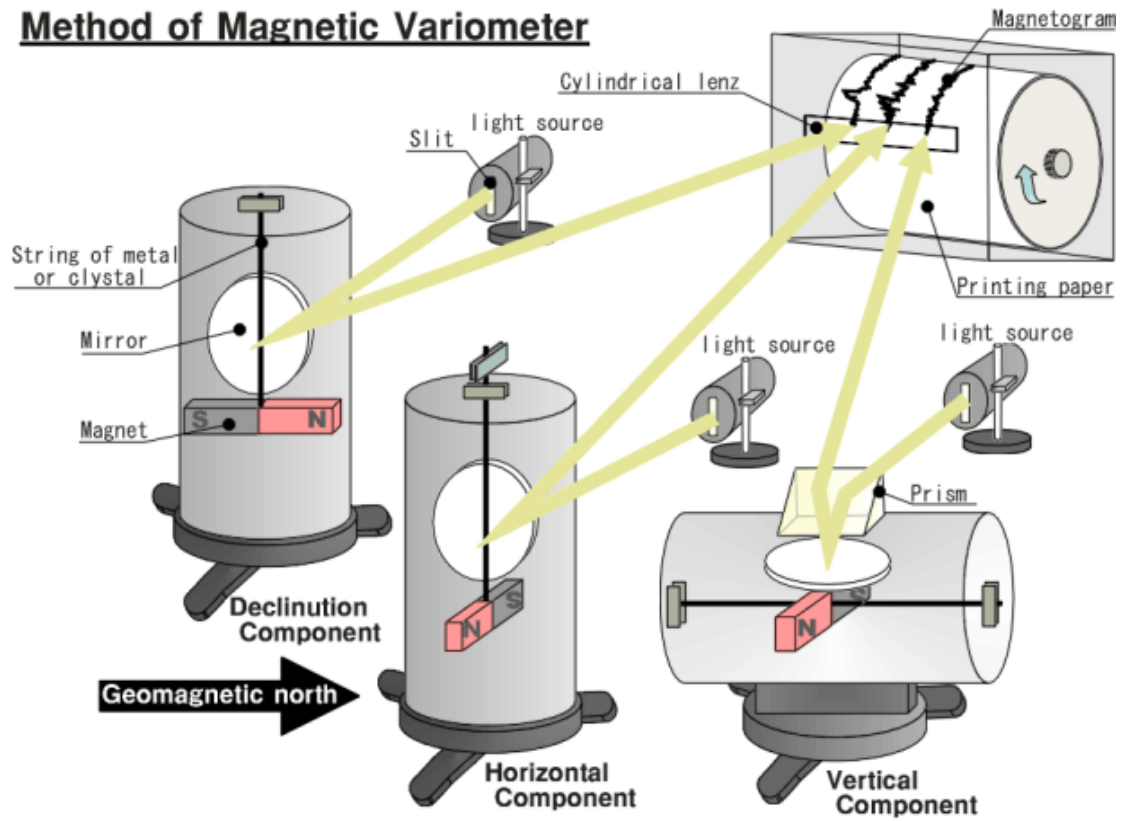
# San Juan, Puerto Rico (SJG)



# Kakioka, Japan (KAK)



## Method of Magnetic Variometer



\*String of the horizontal component is twisted to direct the Magnet perpendicular to the geomagnetic north.

DEPARTMENT OF COMMERCE AND LABOR  
COAST AND GEODETIC SURVEY

O. H. TITTMANN, SUPERINTENDENT

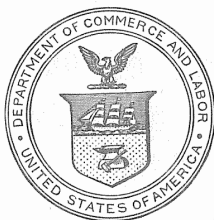
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RESULTS OF OBSERVATIONS MADE AT THE COAST AND  
GEODETIC SURVEY MAGNETIC OBSERVATORY  
AT VIEQUES, PORTO RICO  
1909 AND 1910

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BY

DANIEL L. HAZARD  
Computer, Division of Terrestrial Magnetism



WASHINGTON  
GOVERNMENT PRINTING OFFICE

1912

SEPTEMBER, 1900.

28500r PLUS TABULAR QUANTITIES.

Day	1 <sup>h</sup>	2 <sup>h</sup>	3 <sup>h</sup>	4 <sup>h</sup>	5 <sup>h</sup>	6 <sup>h</sup>	7 <sup>h</sup>	8 <sup>h</sup>	9 <sup>h</sup>	10 <sup>h</sup>	11 <sup>h</sup>	Noon	13 <sup>h</sup>	14 <sup>h</sup>	15 <sup>h</sup>
1	427	425	438	434	431	421	422	413	422	426	420	430	427	425	420
2	432	432	431	433	432	428	419	435	428	432	432	436	426	424	424
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4	437	430	441	438	442	430	438	437	431	436	439	440	441	443	438
5	441	440	444	446	449	450	446	432	434	435	436	434	430	424	417
6	440	438	439	440	439	437	434	439	443	443	437	433	426	439	423
7	436	448	442	442	444	446	446	446	443	439	439	427	425	425	427
8	437	440	443	439	436	443	446	447	437	433	422	424	425	419	418
9	435	434	432	436	435	436	(437)	(438)	438	436	437	438	438	436	435
10*	435	436	439	441	443	444	444	447	454	456	450	451	446	442	432
11*	438	438	438	438	441	441	442	445	450	451	450	448	445	438	434
12*	439	439	440	441	442	442	437	433	442	450	459	461	461	459	449
13*	447	446	444	444	444	443	440	434	440	458	462	462	464	462	454
14	446	443	446	440	440	442	442	445	452	454	455	454	453	448	446
15	456	445	438	444	447	444	437	430	430	436	444	448	448	446	441
16*	443	447	445	446	446	451	453	456	456	453	446	443	438	435	433
17*	441	440	437	442	441	441	442	439	441	446	453	453	455	455	450
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26	230	241	252	256	260	264	268	274	273	278	286	288	297	303	303
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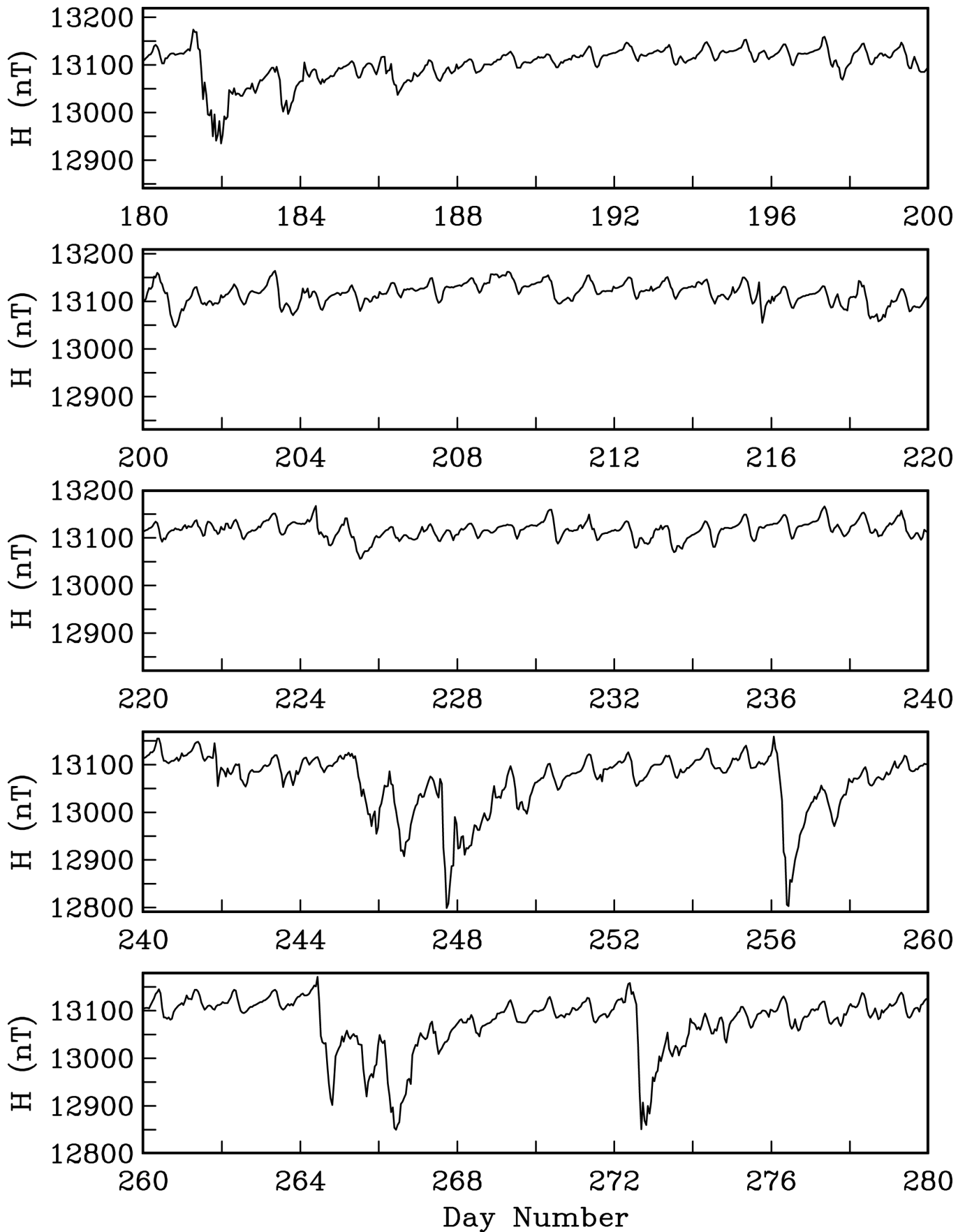
OCTOBER, 1900.

28500r PLUS TABULAR QUANTITIES.

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9	369	370	376	386	(387)	(388)	(389)	(387)	386	389	388	383	386	380	379
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13	401	400	402	402	402	401	399	396	394	397	398	400	394	393	393
14*	404	405	406	408	409	413	419	418	420	421	421	421	422	421	418
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16*	405	406	405	406	407	408	406	409	408	405	402	401	400	401	401
17*	405	407	408	411	412	414	414	415	417	415	412	413	403	403	402
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22	391	386	387	390	393	394	398	404	406	402	400	396	395	392	403
23	362	380	373	375	380	403	403	377	387	377	342	307	305	305	311
24	362	370	375	382	---	---	---	---	---	---	380	356	357	357	362
25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
26	385	382	386	388	389	386	393	401	396	393	393	393	388	388	381
27*	392	391	391	394	398	401	405	408	411	407	404	401	395	388	383
28*	399	400	401	401	403	406	414	421	430	433	430	423	412	401	397
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30*	399	399	402	405	407	408	414	415	412	405	412	415	412	410	411
31	399	398	399	400	402	401	401	400	398	396	398	398	399	397	401
Mean.....	384	386	387	389	391	393	396	398	399	399	397	394	390	387	385
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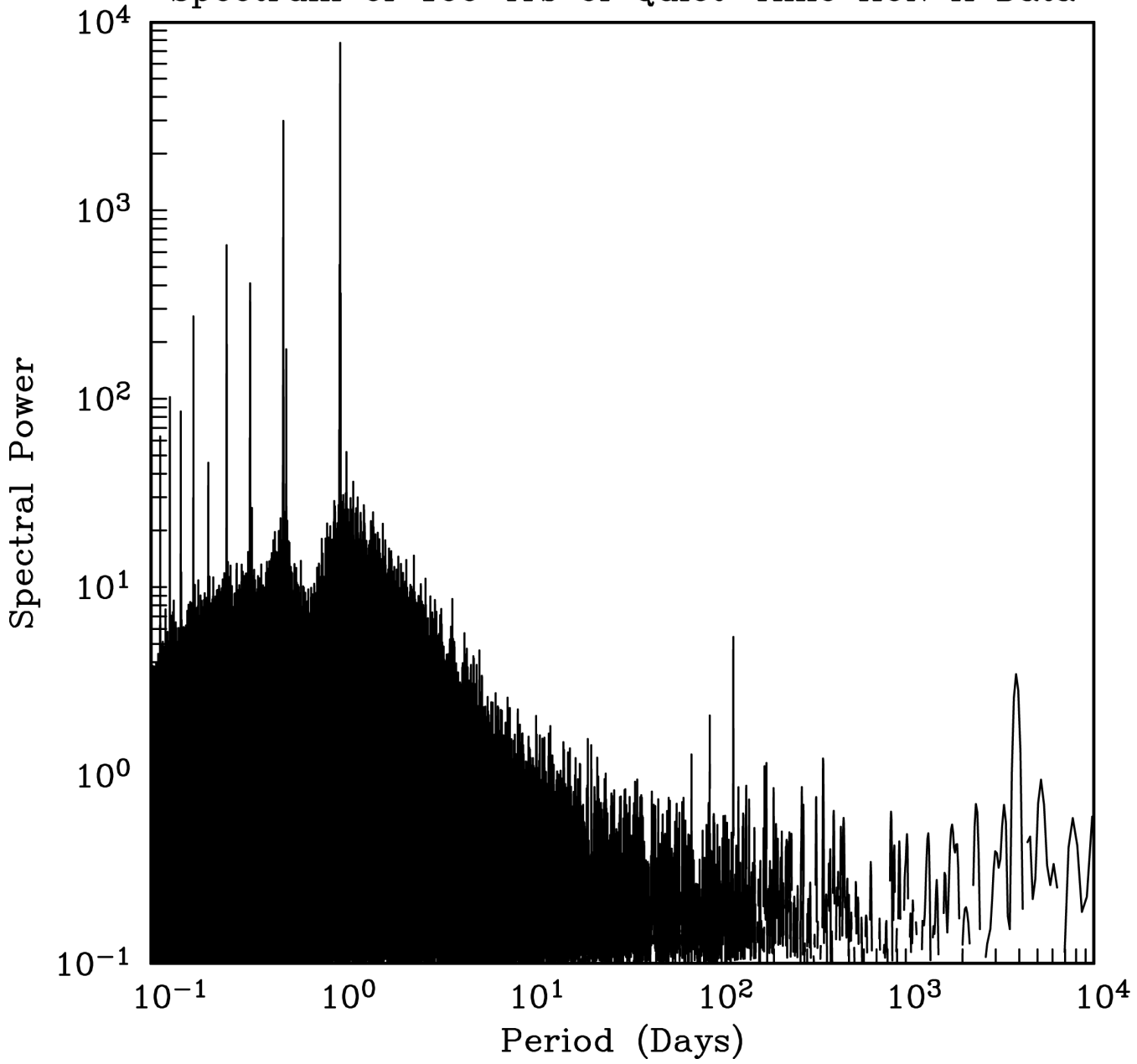
\* The mean hourly values given on the bottom line are derived from the "quiet days" indicated by asterisks.

29 Jun - 7 Oct 1957 HER H Data

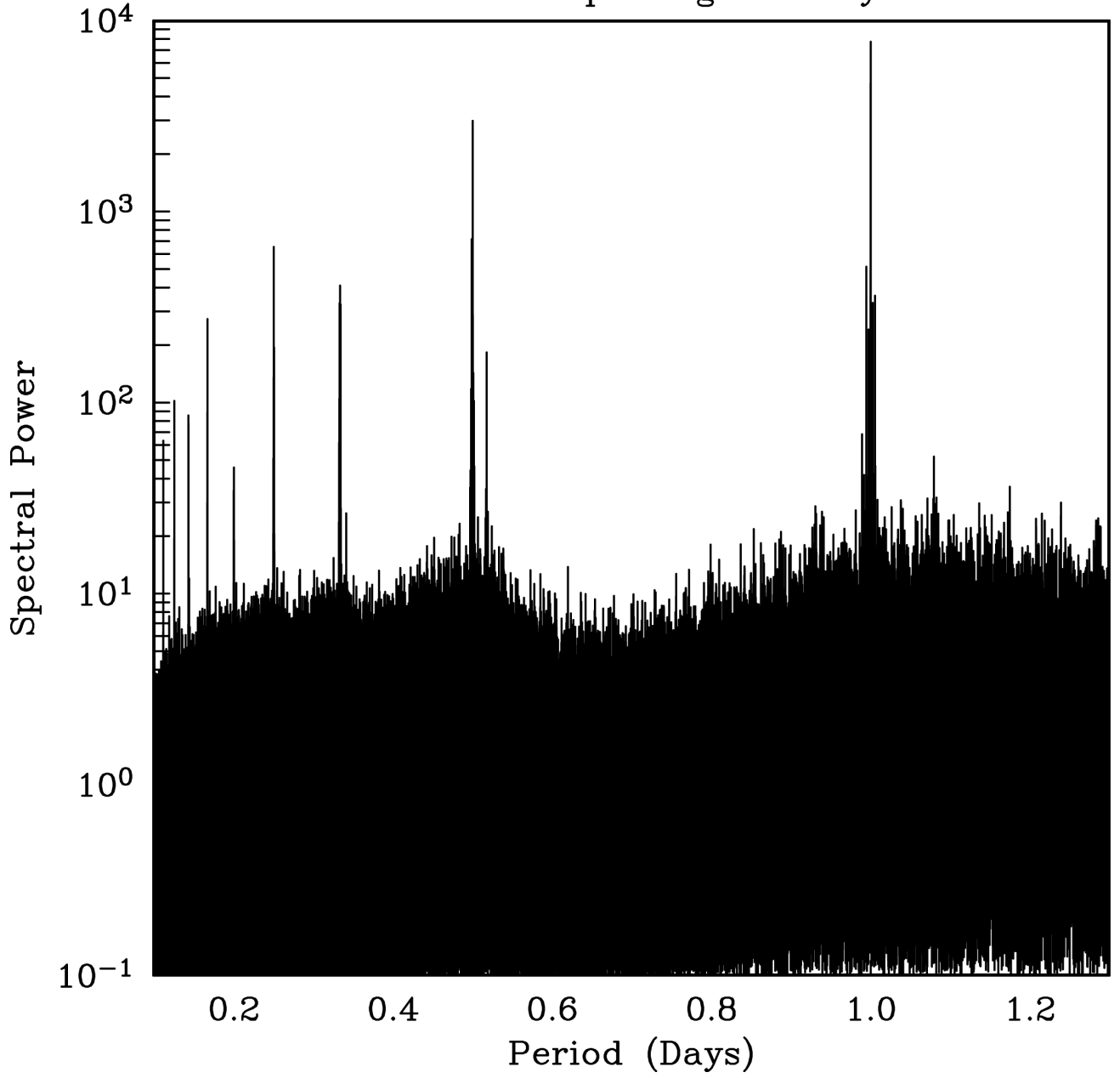




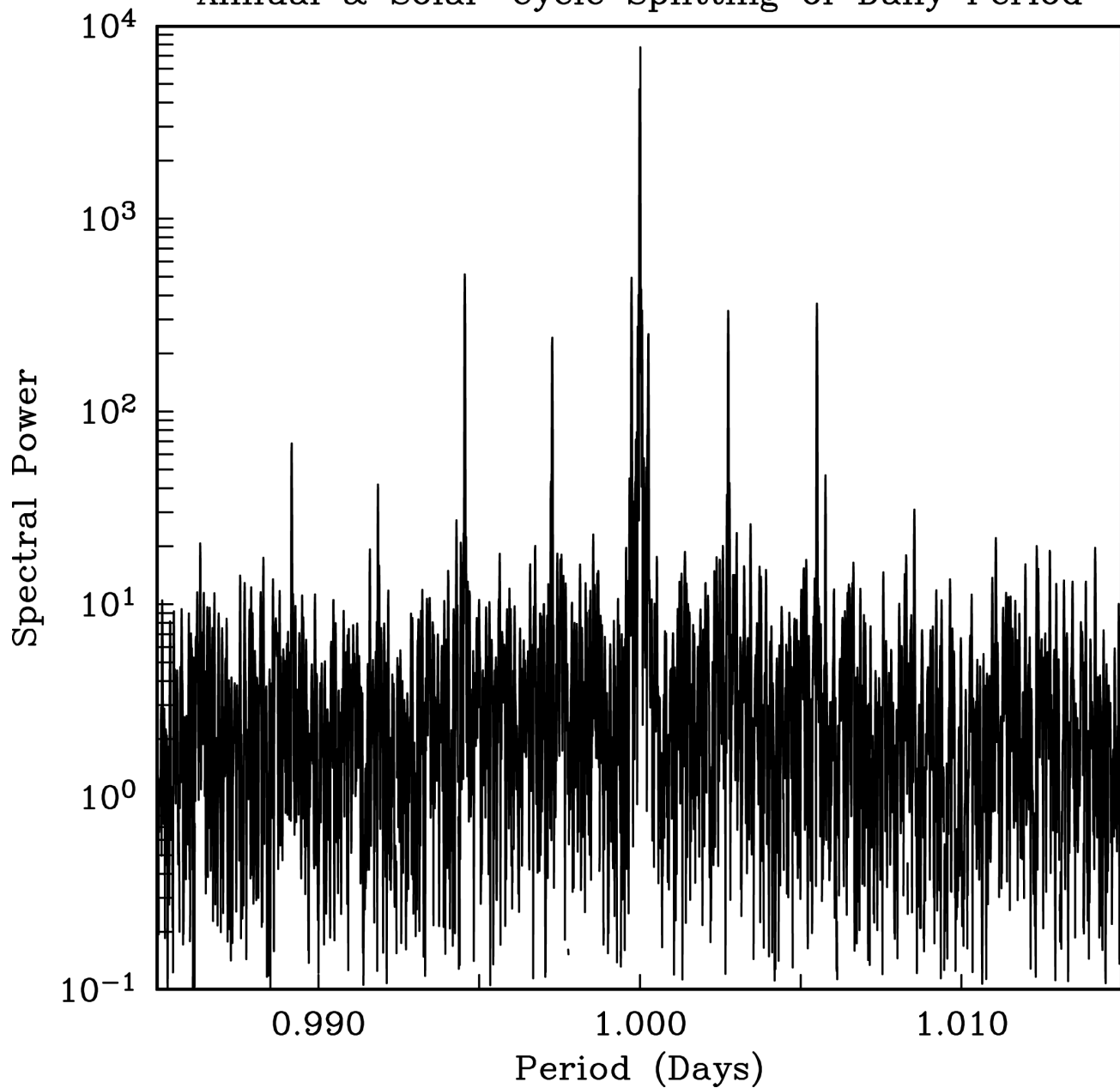
Spectrum of 100 Yrs of Quiet-Time HON H Data



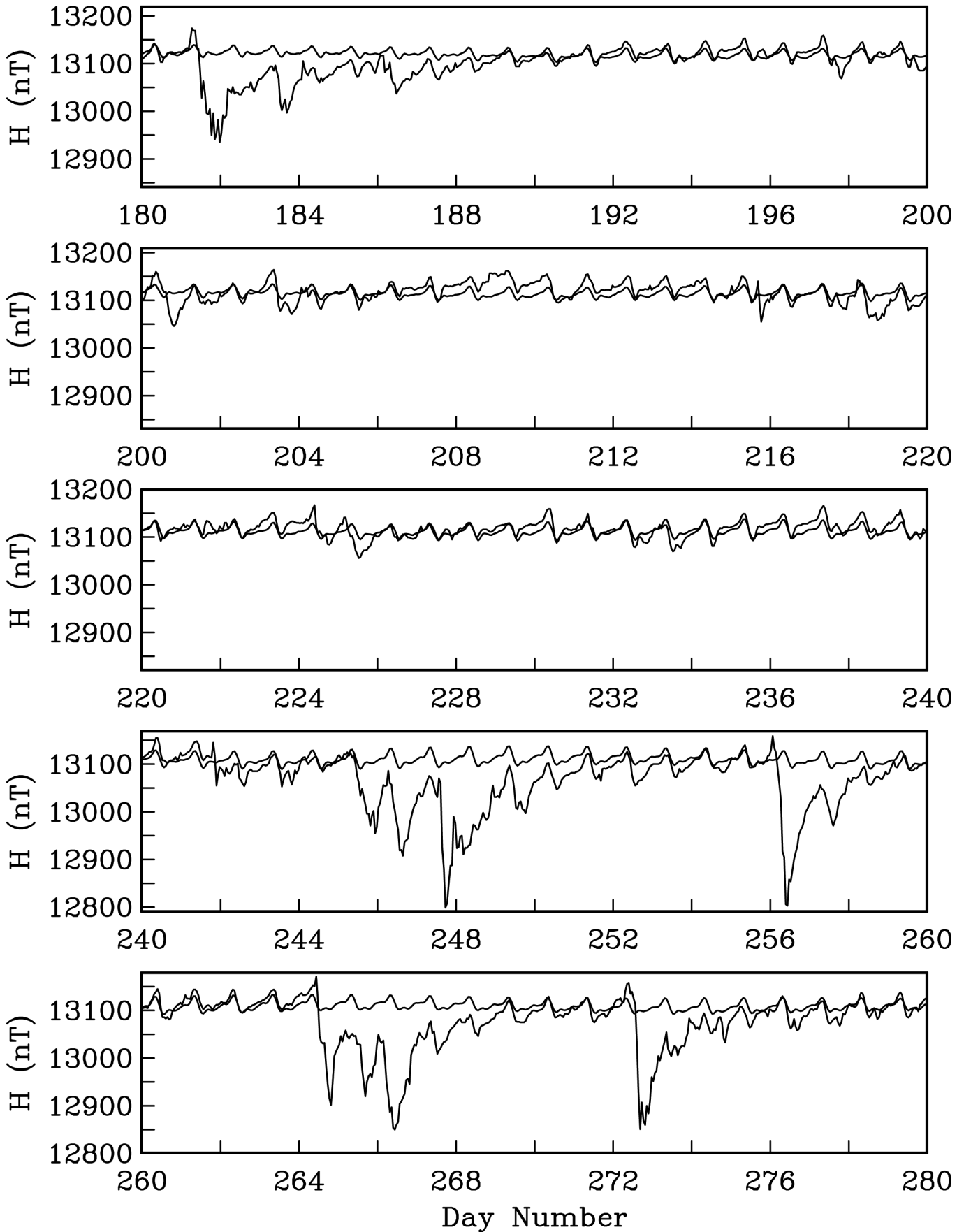
Lunar & Annual Splitting of Daily Period



Annual & Solar-Cycle Splitting of Daily Period



29 Jun - 7 Oct 1957 HER H Data



# 1957 Magnetic Storm Made the headlines in Los Angeles

RARE NORTHERN LIGHTS DISPLAY IN SOUTHLAND

Los Angeles Times (1886-Current File) pp 13, 1957 ProQuest Historical Newspapers Los Angeles Times (1881 - 1985)  
pg. 1

## RARE NORTHERN LIGHTS DISPLAY IN SOUTHLAND

### Aurora's Blood-Red Glow Observed Over Widespread Region

The blood-red glow of an aurora borealis, luminous phenomenon of the Arctic regions, spilled over to light the Southland skies early today.

The borealis, also called "northern lights," is a common sight in the northern regions, but it seldom is seen this far south, and it caused a commotion of calls to police. Sheriff's deputies and newspapers by startled observers.

Confirmation of an aurora was contained in a report received by the U.S. Weather Bureau at International Airport, from a pilot flying over Seattle, who remarked about the "very good aurora borealis" he had just seen.

Radio Signals Fade  
And at the Police Department's Central Communications in Los Angeles, operators reported they had trouble with fading radio signals, which is commonly associated with the electrical disturbance of an aurora.

It lasted at least two hours. A. H. Holmstead, night assistant at Mt. Wilson Observatory, said he first saw a red glow in the sky, to the northwest, at 11:30 p.m. At 1:30 a.m. a fireman's daughter in Altadena said the ruby-tinted light was reflected on the window panes of the house.

Changes Slowly  
Whittier Police Officers Guy Gilmore and Blaine Johnson watched the mantle of red in the sky from their patrol car. It appeared to be circular, they said, blood red in color toward the center and fading at the edges. It changed in size as it moved very slowly southward, according to their observations.

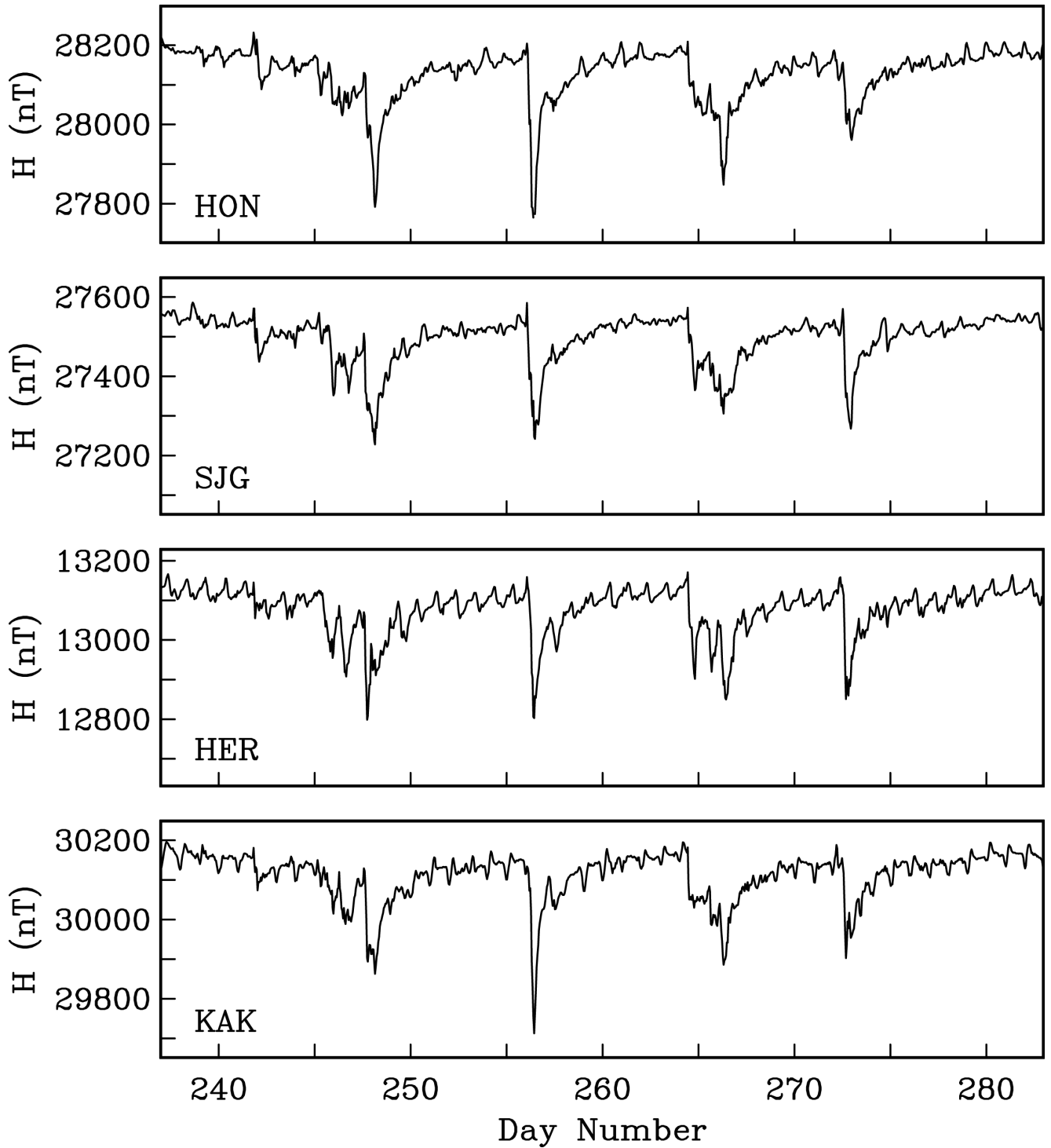
A resident in Fullerton said it looked as if "one fifth of the sky is lit up." In Downey, south of Whittier, observers said the light was almost maroon in color, it was so deep.

Calls came from Tujunga, Sunland, Malibu.

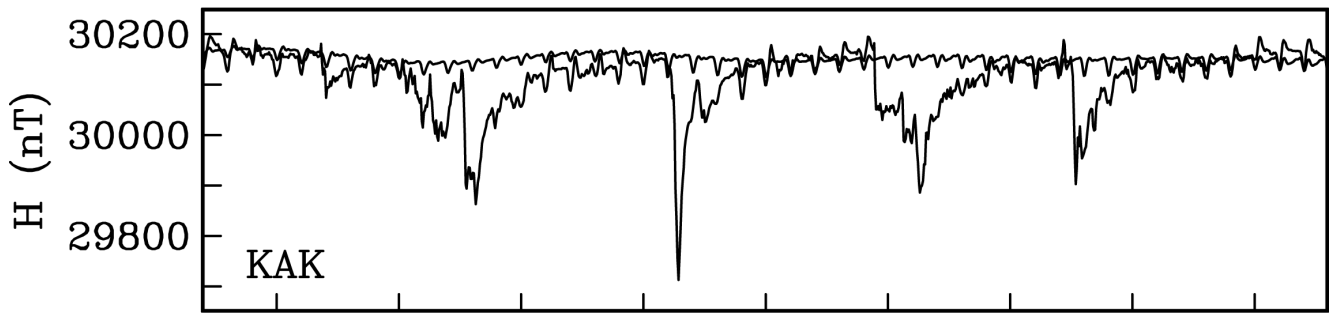
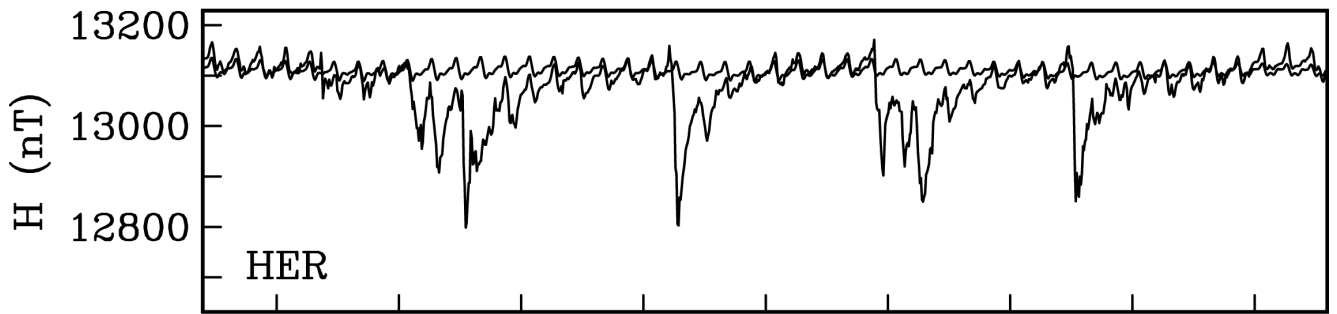
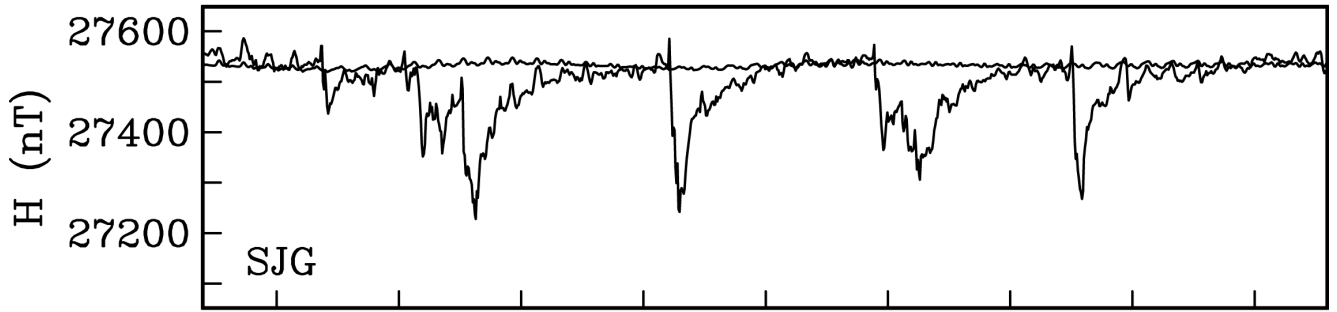
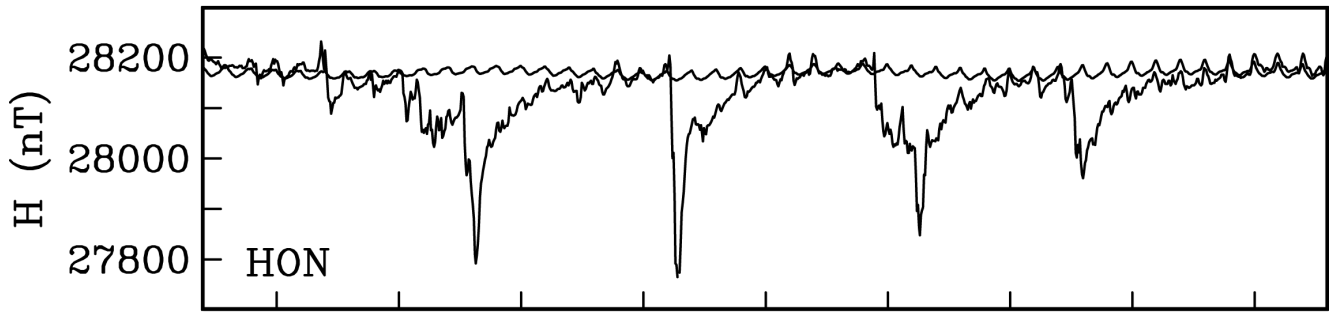
The glow was believed spread by reflection on an

Turn to Page 2, Column 6

25 Aug - 9 Oct 1957 H Data



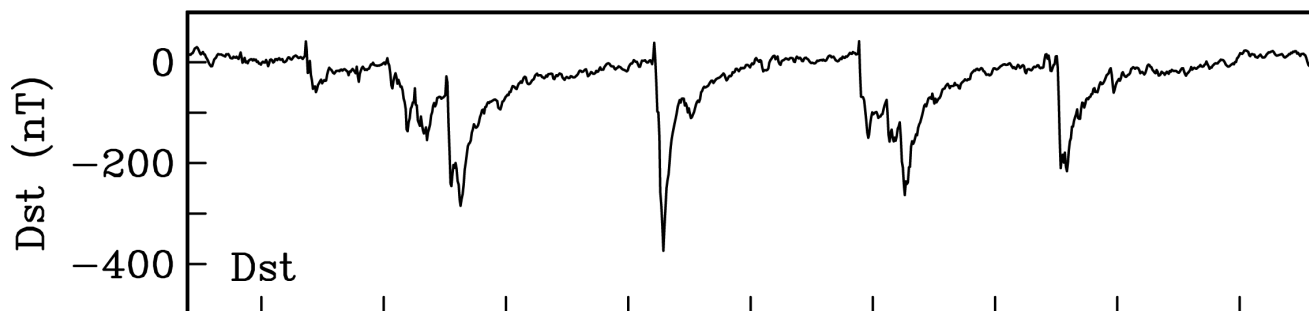
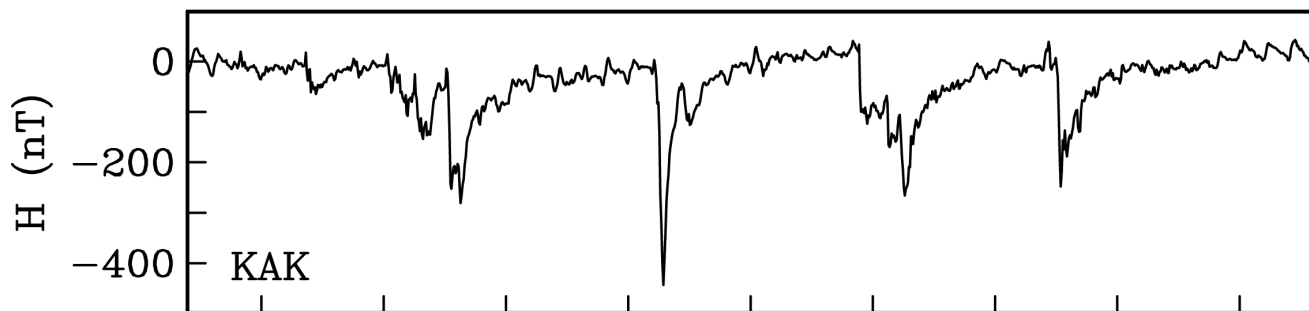
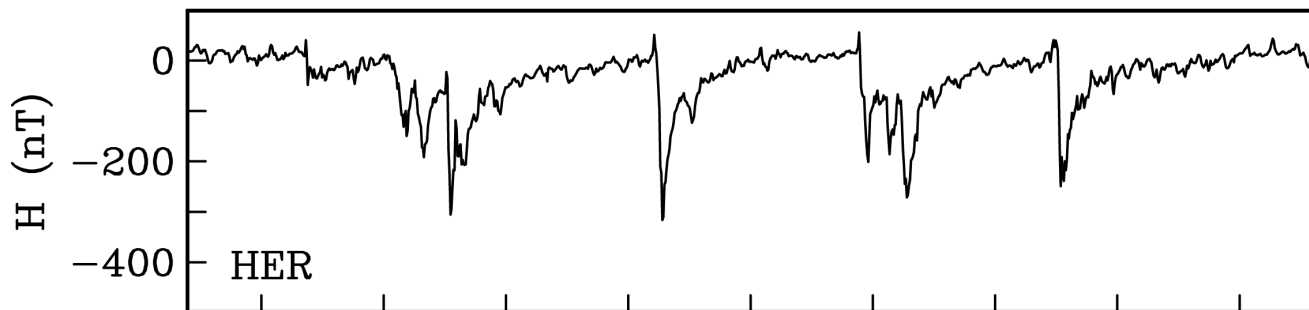
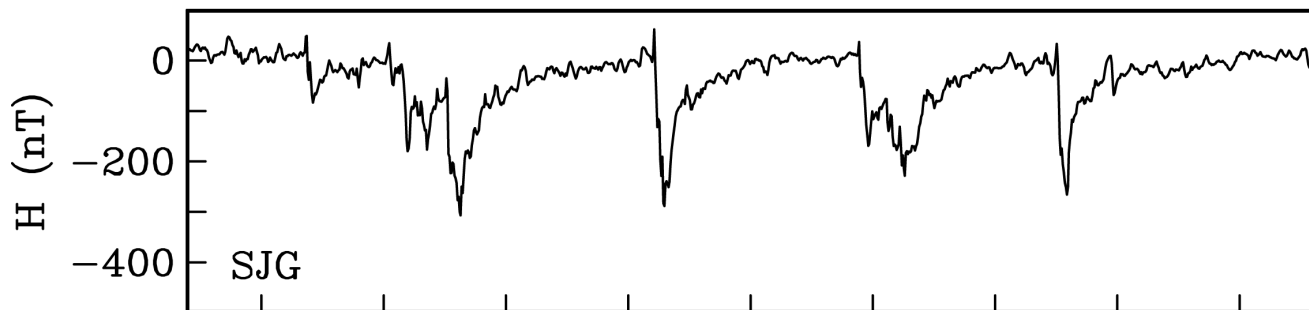
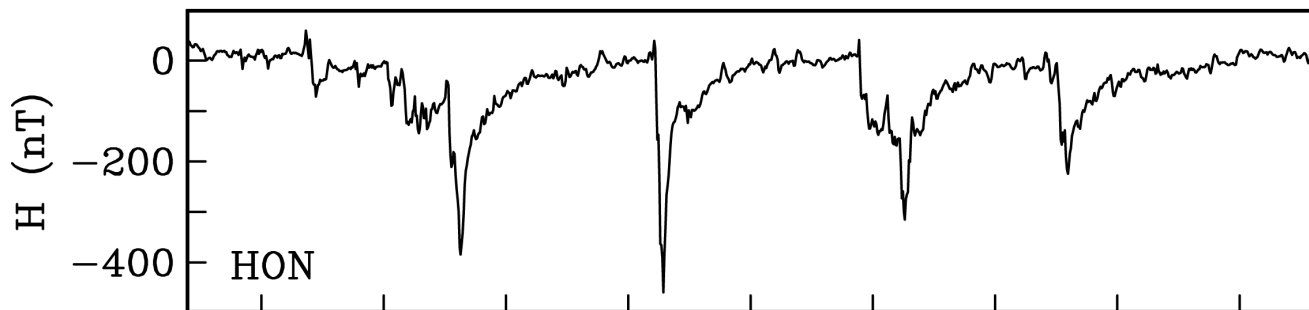
25 Aug - 9 Oct 1957 H Data & Sq Model



240 250 260 270 280

Day Number

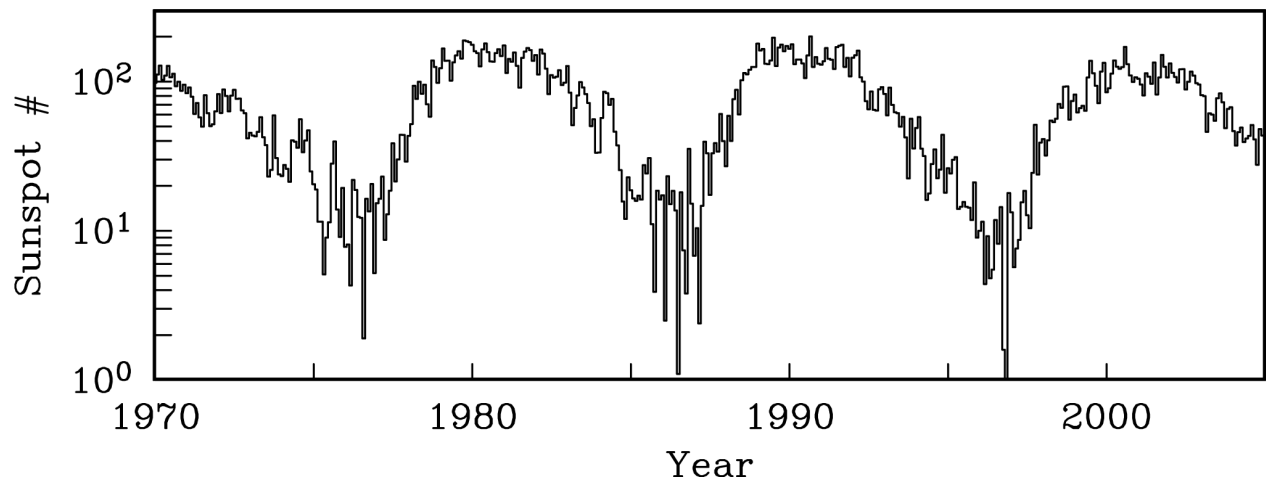
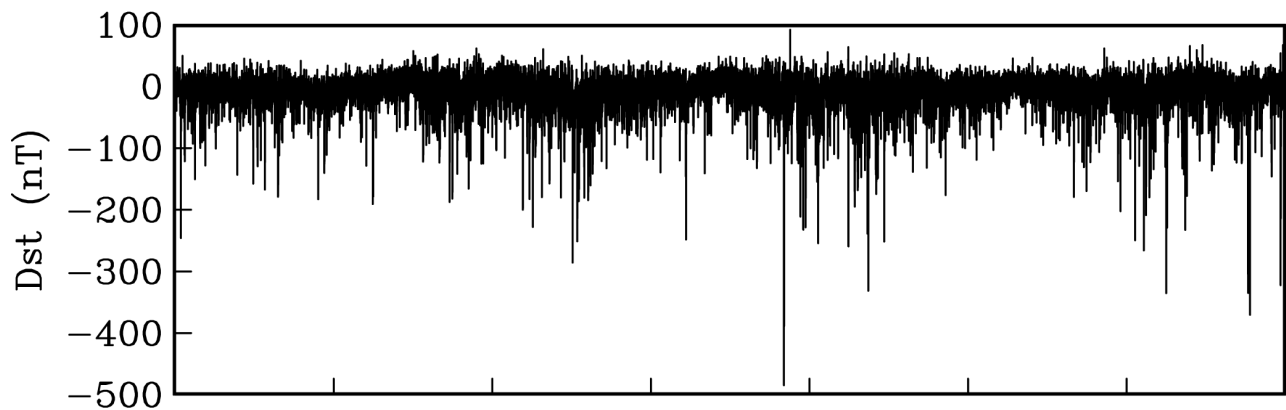
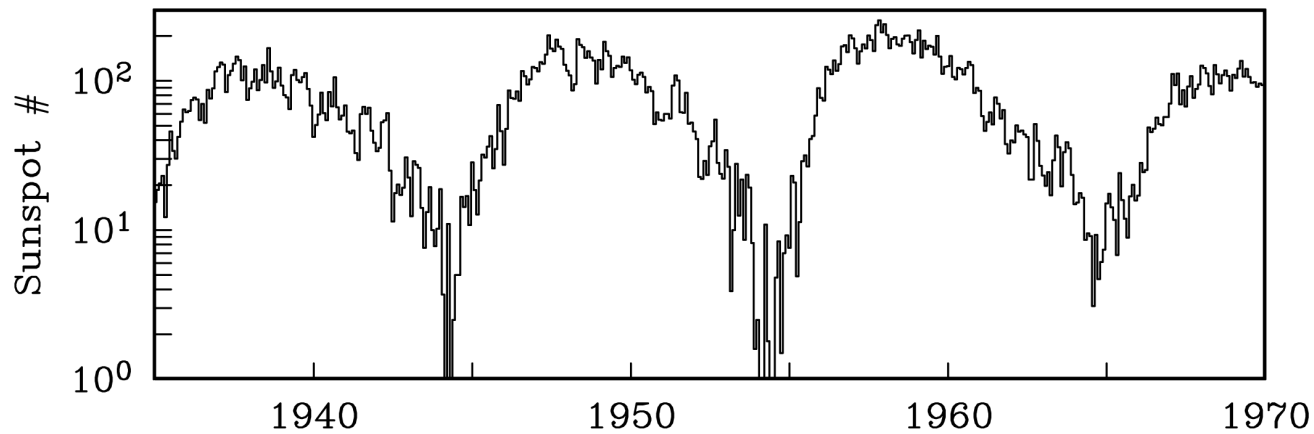
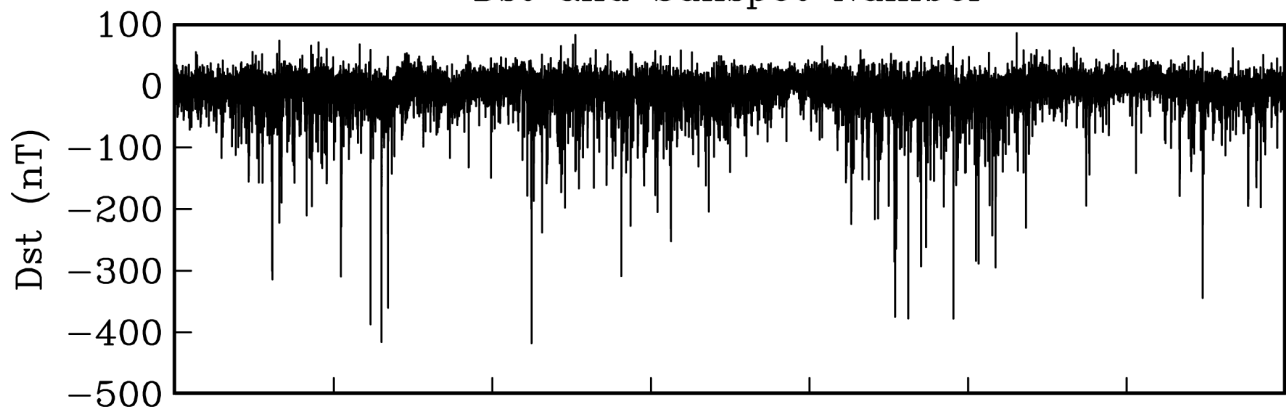
25 Aug - 9 Oct 1957 H Data - Sq Model & Dst

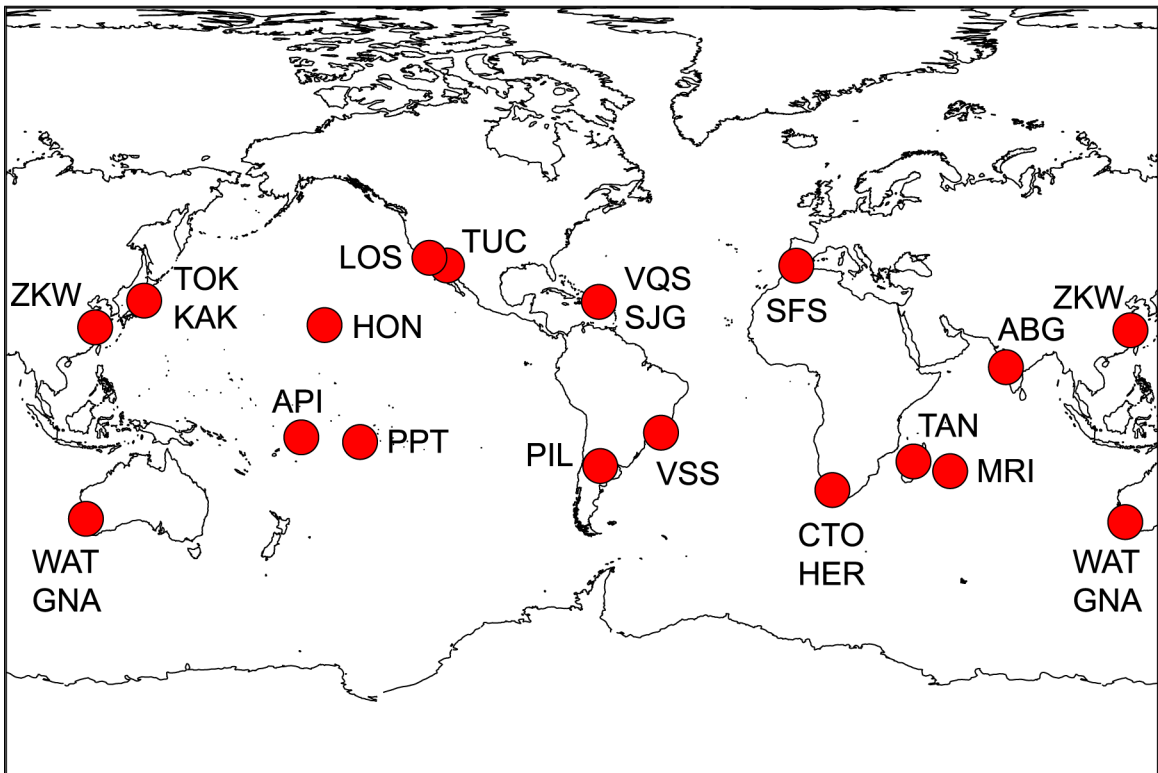


240 250 260 270 280  
Day Number



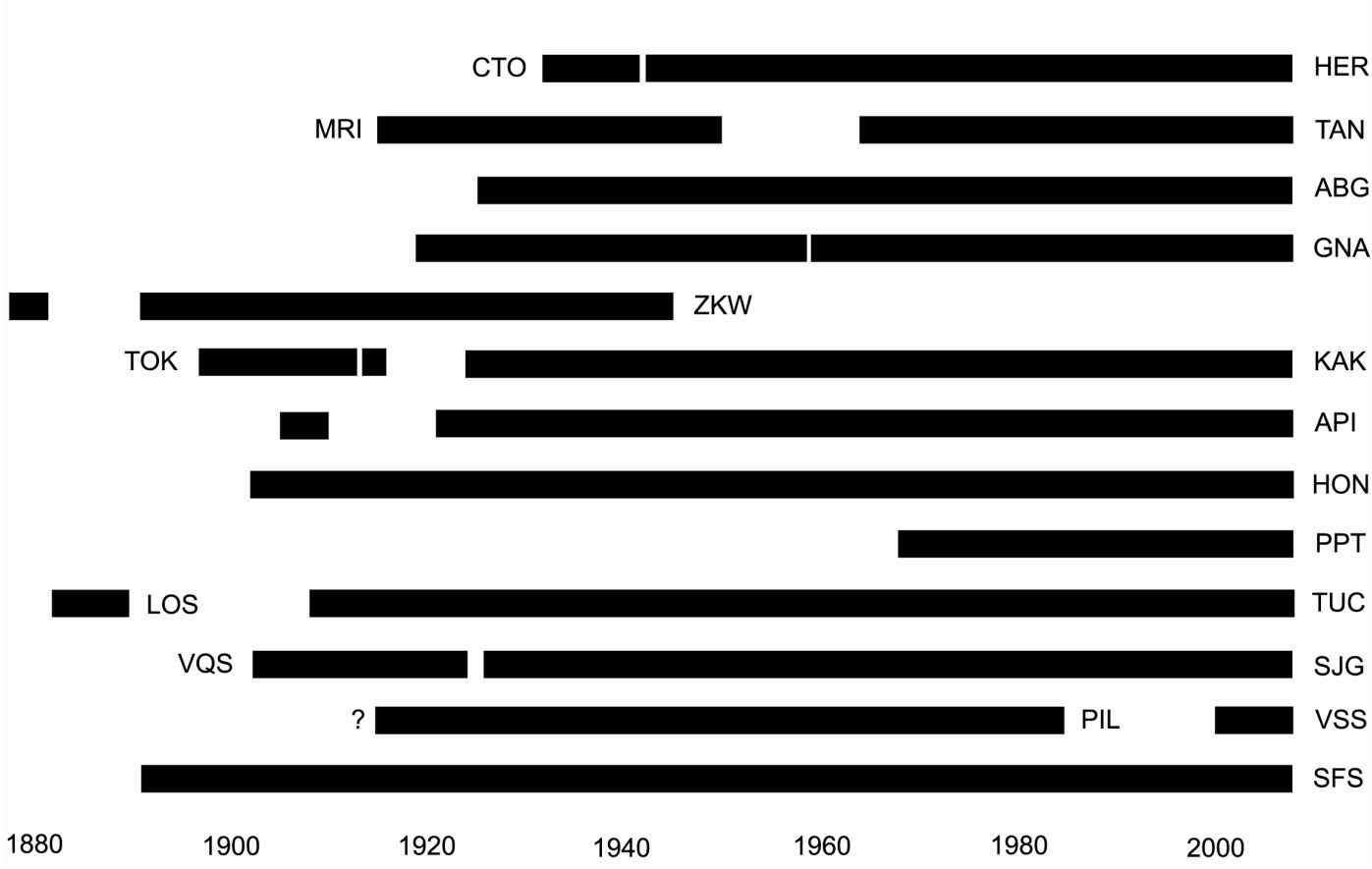
# Dst and Sunspot Number





CTO	Cape Town South Africa	1932-1941
HER	Hermanus South Africa	1942-2007
TAN	Tananarive Madagascar	1964-2007
MRI	Mauritius	1915-1950
ABG	Alibag India	1925-2007
WAT	Watheroo Australia	1919-1958
GNA	Gnangara Australia	1958-2007
ZKW	Zi Ka Wei China	1877-1882 & 1889-1945
TOK	Tokyo Japan	1897-1912
KAK	Kakioka Japan	1913-1916 & 1924-2007
API	Apia Western Samoa	1905-1911 & 1921-2007
HON	Honolulu United States	1902-2007
PPT	Papeete Tahiti	1968-2007
LOS	Los Angeles United States	1882-1888
TUC	Tucson United States	1908-2007
PIL	Pilar Argentina	1915-1984
VQS	Vieques Puerto Rico	1903-1925
SJG	San Juan Puerto Rico	1926-2007
VSS	Vassouras Brazil	1999-2007
SFS	San Fernando Spain	1891-2007

# Continuity of Dst-Suitable MHV Data Arranged by Longitude



# Conclusions

- Century-long (or even longer) record of Dst is possible, giving a good long-term history of magnetic storms.
- Much work remains to be done, however, including digitizing data from a number of observatories & checking those data for problems and consistency with yearbooks.
- Improvements in mathematical Sq model are needed. This is an on-going effort.
- With the incorporation of data from (say) eight or more observatories, the statistical properties of the asymmetric part of the ring current can be studied.