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SVIRCO DATA: January to December 2000

Fabrizio Signoretti, Francesco Re,
Marisa Storini and Mario Parisi

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ISTITUTO DI FISICA DELLO SPAZIO INTERPLANETARIO

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Abstract

The pressure corrected intensity of the nucleonic component, produced by primary cosmic rays and recorded by Rome Neutron Monitor, is reported for the period from January to December 2000, together with the barometric pressure data in tabular and graphic form.

THE SVIRCO OBSERVATORY

During the 1st International Geophysics Year (1957) a worldwide network of “ground-based detectors” for continuous cosmic ray measurements was established. The Rome cosmic ray station was admitted into this network, aiming to study the time variation of primary cosmic rays (Studio Variazioni Intensità Raggi Cosmici: SVIRCO) and their modulation in the heliosphere.

From July 1957 to April 1997, the SVIRCO observatory performed uninterrupted measurements at the Physics Department “G. Marconi” of “La Sapienza” University of Rome (41.90° N, 12.52° E, altitude about 60 m a.s.l.)

In May 1997 the Rome detector was moved to the Physics Department “E. Amaldi” of “Roma Tre” University. Since then it has been continuously running at the new location (41.86° N, 12.47° E, altitude about s.l.). The observatory has been housed in a reserved building fitted with a double air conditioning system. The inner temperature has been restrained in a range of 23°-28° C, meanwhile the relative humidity has been kept down 57%. Either the environmental parameters have been continuously checked by digital sensors. The detector was a standard 17-NM-64 Neutron Monitor consisting of four 3-counter and one 5-counter units (sections).

All the BF₃ proportional counters (BP-28 type) were equipped with smart amplifier/discriminator circuits, complete with spectrum stabilizers. These new electronic units, developed in our laboratory, increased widely the immunity against variations of high voltage. As a result, the pulses spectrum at the amplifier output of each counter was firmly fixed across a range of more than 150 volt, around the operating voltage.

However, systematic and exhaustive tests of the counters were performed. The output pulses of the amplifiers, discriminated by the threshold gates, were collected and stored into a multi-channel analyzer. Through the analysis of the height distribution (spectrum) of the amplifier pulses coinciding with the discriminator ones, it was possible to verify the efficiency of each counter together with the amplifier gain and the discriminator threshold level.

In addition to the amplifier/discriminator circuits, a large part of the electronic instrumentation working in the observatory was designed and realized in our laboratory, as well as the software for data acquisition and pre-elaboration.

The data acquisition system was remotely controlled by a dedicated computer and timed by a high stability quartz clock. The equipment ran according to a timing of 5' minute and recorded the counting rates of the different 5 sections as well as the rates of the overall multiplicity, sorted into separated counting channels (from 1 to greater than 8).

More details on the acquisition system for 2000 can be found on the included block diagram.

The atmospheric pressure was simultaneously measured by means of not less than three barometers. These instruments were constantly checked out each other for the best measurement accuracy and reliability. Furthermore the barometers, which achieve a resolution up to 0.01 hPa, had been equipped with different kinds of transducers such as vibrating cylinder, force balance and quartz. This ploy allowed us, throughout their different behaviours, to point out potential long-term drifts and eventually to re-calibrate them

The overall stability of the monitor was controlled by means of the section ratios. The hourly counting rate of each section, divided by the total rate, was plotted on a daily diagram. Moreover the daily averages were plotted in a monthly histogram. The annual series of histograms shows the long-term stability of each section.

Finally, in order to verify the coherence between the time variations of the nucleonic intensity recorded by Rome and by another such a similar observatory, a comparative data analysis was performed with neutron monitor data of Hermanus (South Africa - 34.43° S, 19.23° E, altitude 26 m a.s.l.). This observatory was chosen because of its data availability and threshold rigidity, which is equal to 4.45 GV (1995). Both data sets were normalized to their respective annual average and then plotted, together with their ratio, on daily basis and also in a regression form (Rome: 100% = 447753 cts/h - Hermanus: 100% = 399556 cts/h).

We acknowledge the Unit for Space Physics of North-West University (Potchefstroom-South Africa) for Hermanus Neutron Monitor data.

DATA PRESENTATION

The intensity data of the secondary nucleonic component of cosmic ray detected in Rome, at the SVIRCO observatory, were corrected for pressure variations at a reference level of 1009.25 hPa with an attenuation coefficient of 0.70% / hPa.

a) Tables

The hourly corrected data have been reported in tabular form for each month together with the daily section ratios R_i ($i = 1, \dots, 4$). The R_i ratios (%) were computed as rate of each section (channel i) divided by total rate. Only $n - 1$ section ratios have been provided, being n the number of sections.

The hourly and daily averages of the atmospheric pressure, measured in hPa at the Observatory, have been presented in monthly tables too.

Furthermore, the monthly averages of the values, reported either in the corrected-data tables or in the pressure ones, have been shown below them.

b) Graphs

The hourly-corrected data were multiplied by a suitable normalization factor and plotted in monthly graphs. The normalization was evaluated as percentage of the counting rate average in the period from January to February 1997, during which the Monitor had been operating at the previous location of "La Sapienza" University. The reference counting rate level (100%), computed for such a referential period, is equal to 554946 counts/hour. The set of normalized graphs has been provided for long-term analysis.

The monthly graphs of the atmospheric pressure have been reported too.

CONDITIONS FOR SVIRCO DATA USE

You are welcome to use SVIRCO neutron monitor data of IFSI/INAF-UNIRomaTre collaboration under the following conditions:

-You agree to acknowledge our financial supports in any published use of the data.

Example: ***"SVIRCO NM is supported by the INAF - UNIRomaTre collaboration"***

-You are kindly requested to send a copy of any published work derived from our data to:

Dr. Marisa STORINI

Head of SVIRCO Observatory & TPL

Istituto di Fisica dello Spazio Interplanetario - Area di Ricerca Tor Vergata

Via del Fosso del Cavaliere, 100 00133 Roma - Italy,

storini@fis.uniroma3.it or storini@ifs.rm.cnr.it

HOURLY RECOVERED DATA - YEAR 2000

When the whole counting rate of the Neutron Monitor was lost for less than a 15 min interval (*) or a section was inoperative (°), the hourly data were recovered as reported in the table.

Month	Day	Time (UT)
05	26	15 -16 (*)
10	05	08 -10 (°)
10	26	14 -15 (*)
11	16	11 -12 (*)

RELEVANT MONITOR AND DATA CHARACTERISTICS FOR 2000

Cosmic Ray Observatory Rome or SVIRCO
Geographic coordinates 12.47°E, 41.86°N
Altitude Sea level
Threshold rigidity (year) 6.27 GV (1995)
Instrument 17 NM - 64 (*four 3-counter and one 5-counter units*)
Scaling factor 1
Pressure coefficient 0.70 % / hPa
Pressure reference level 1009.25 hPa (*level used to maintain data continuity from 1957*)

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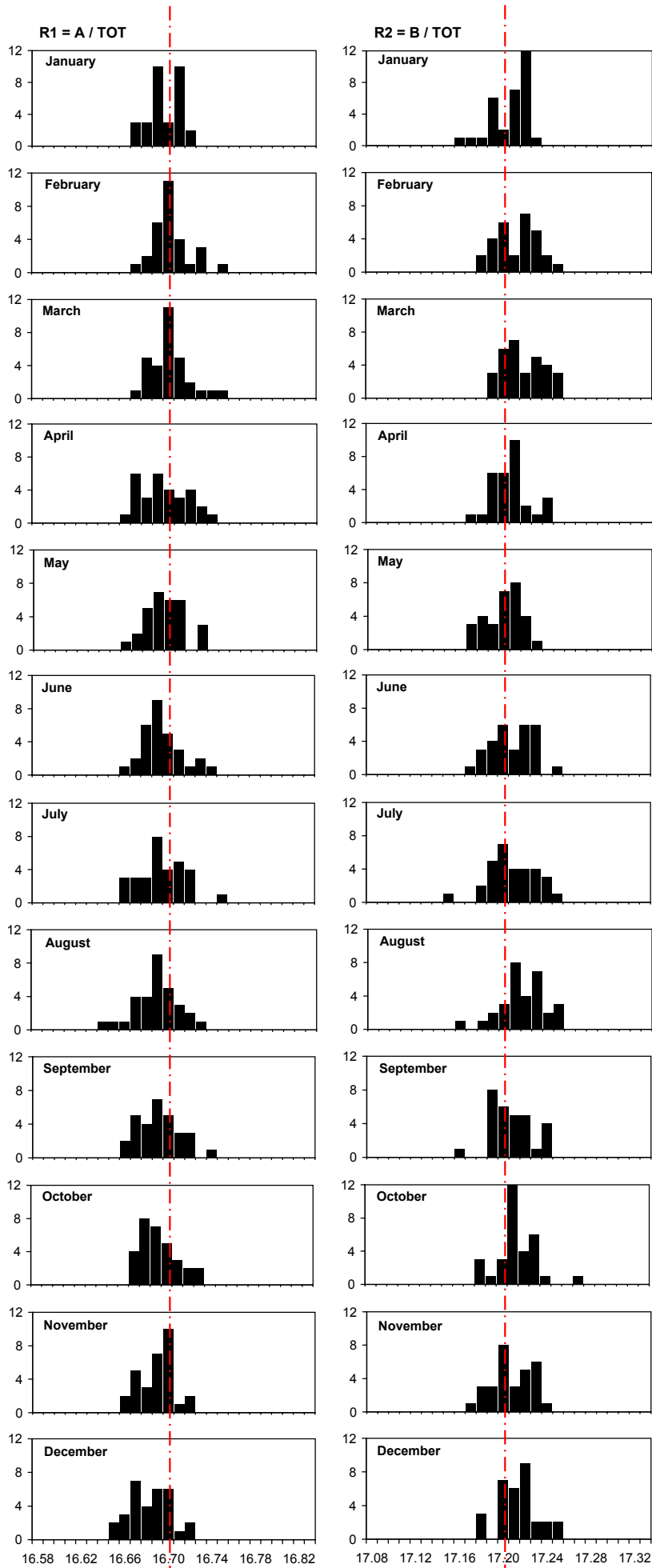
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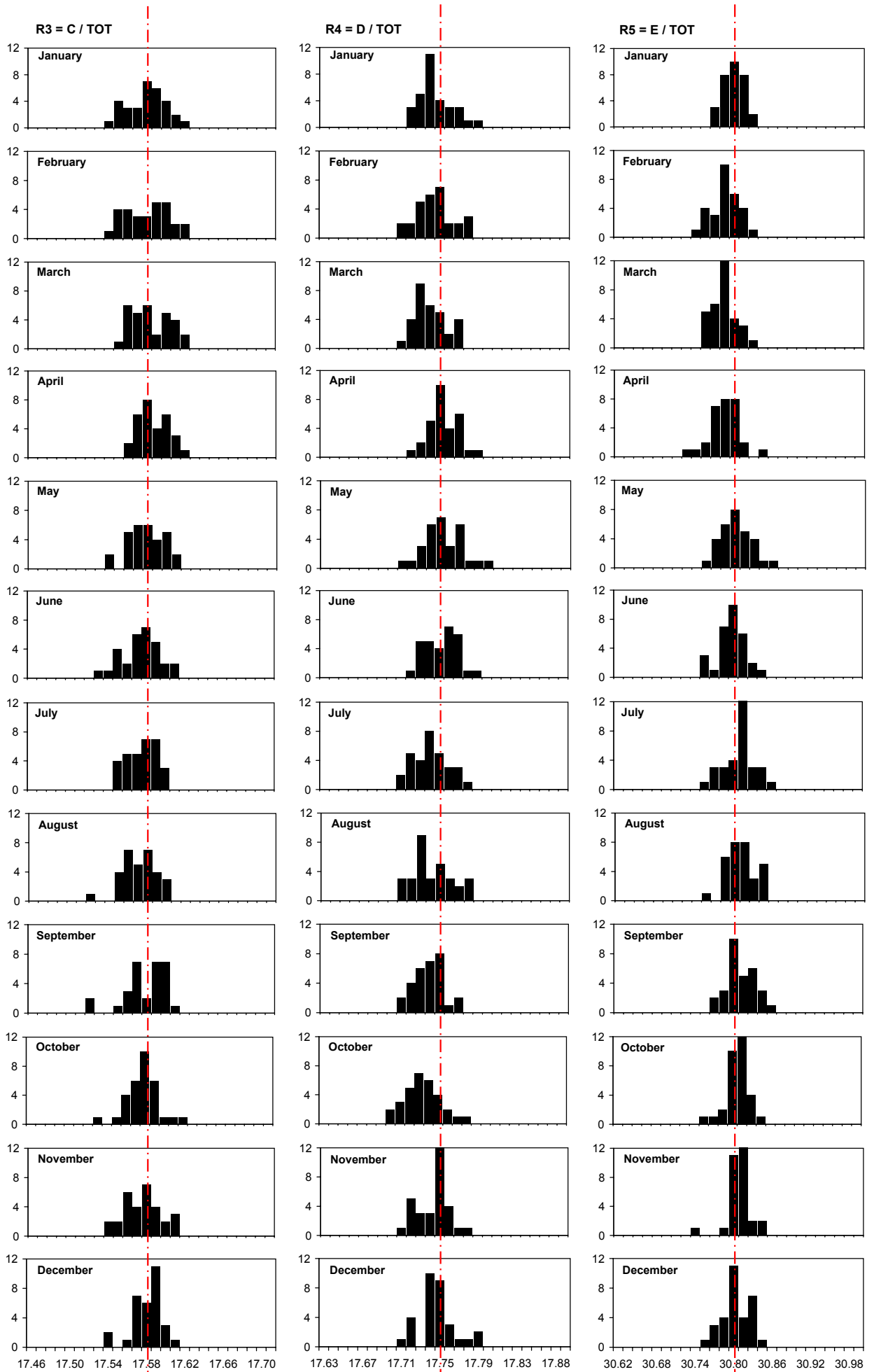
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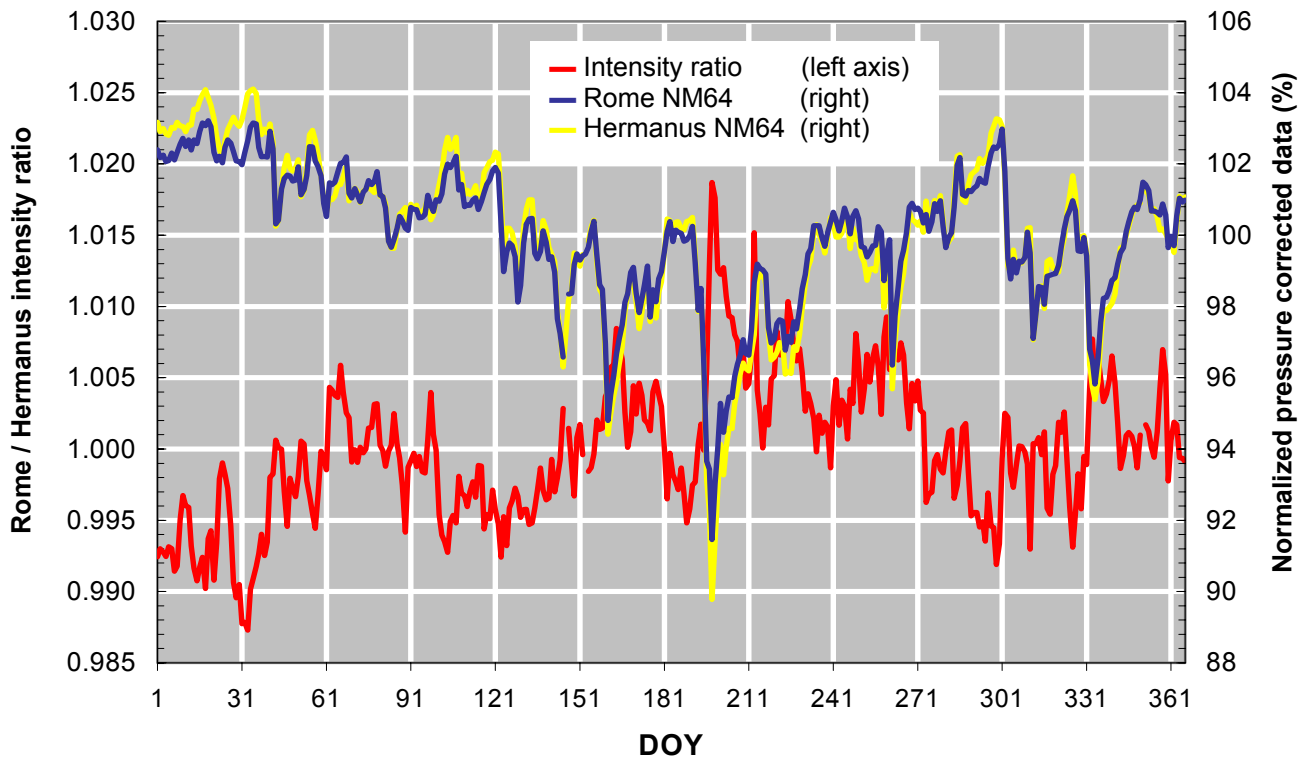


S.V.I.R.CO. Observatory - Year 2000
Ratios of Neutron Monitor Units

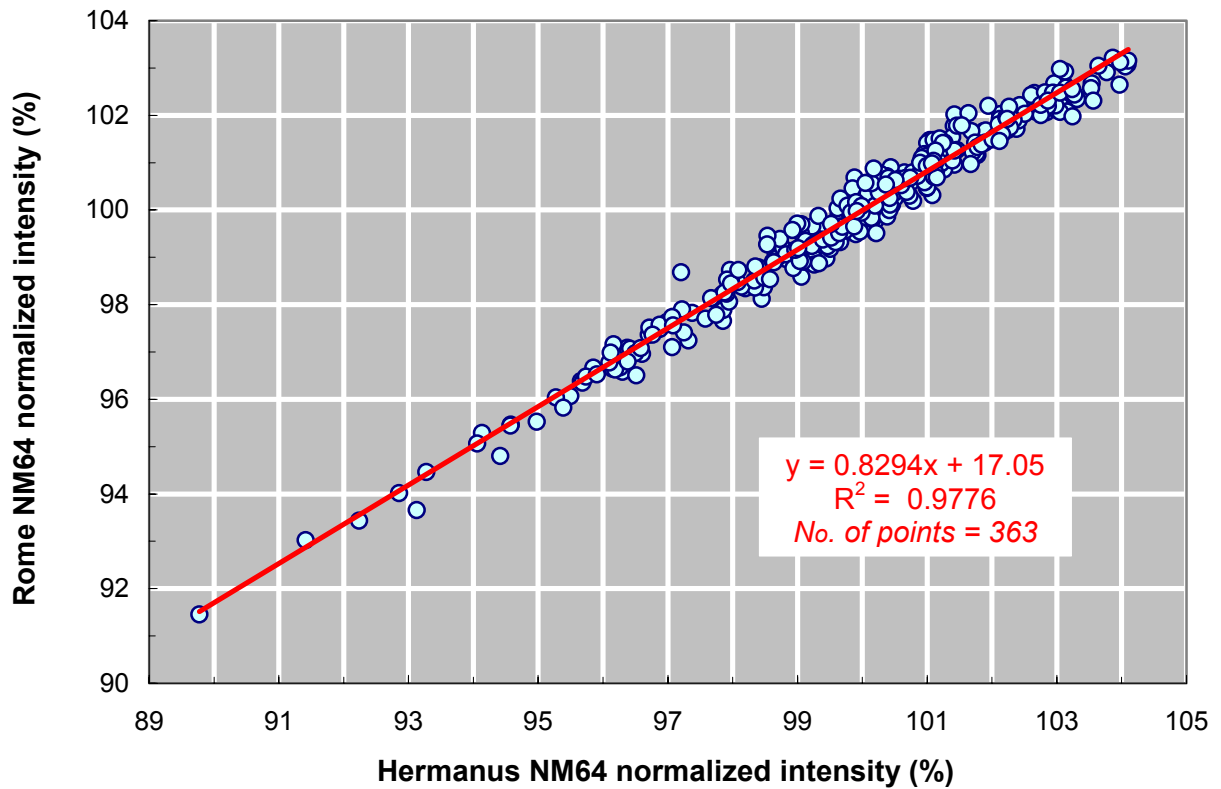


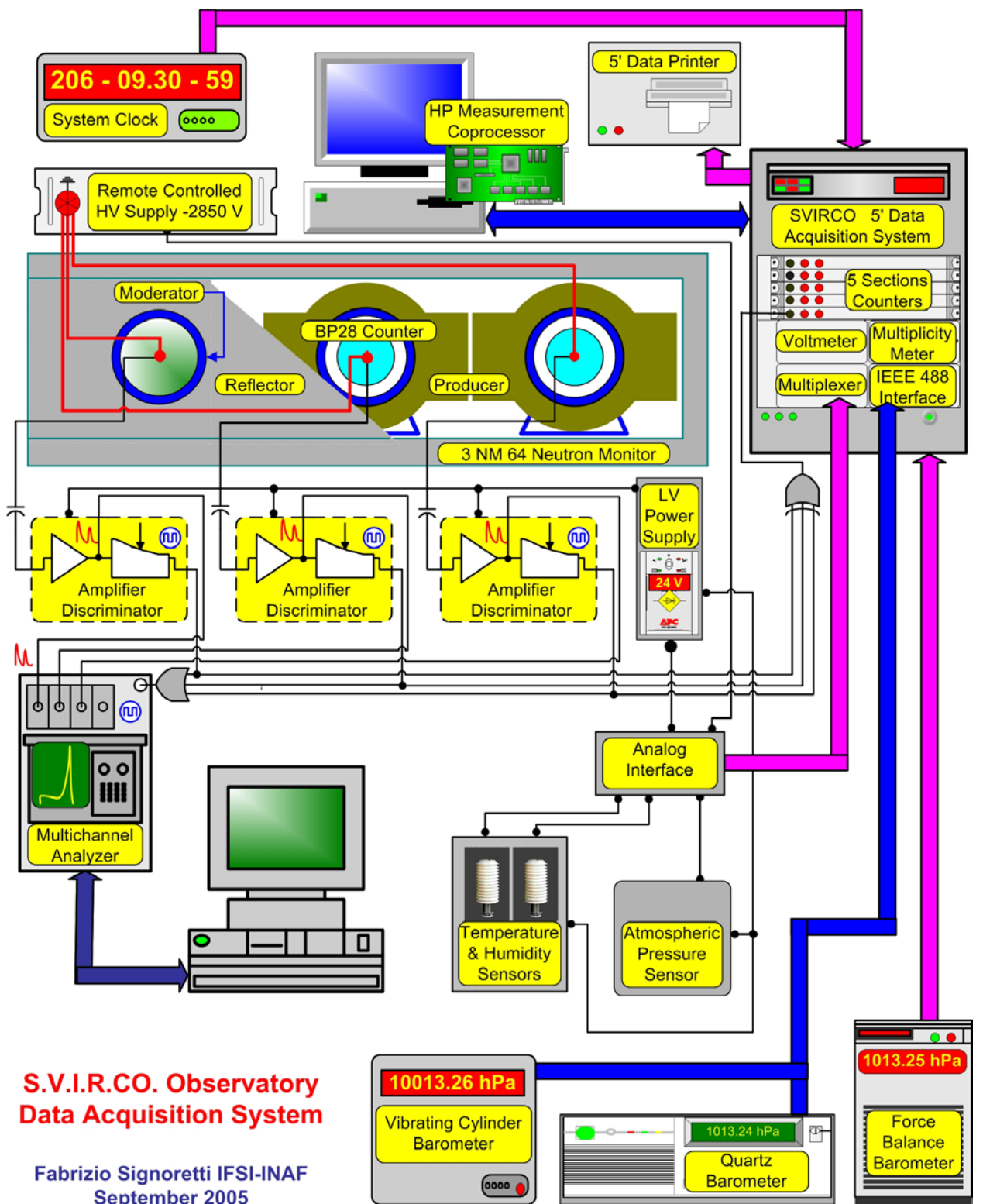
S.V.I.R.CO. Observatory - Year 2000
 Ratios of Neutron Monitor Units

Rome and Hermanus NM64 daily data - Year 2000
 (Rome: 100% = 447753 cts/h - Hermanus: 100% = 399556 cts/h)



Regression plot of daily values - Year 2000

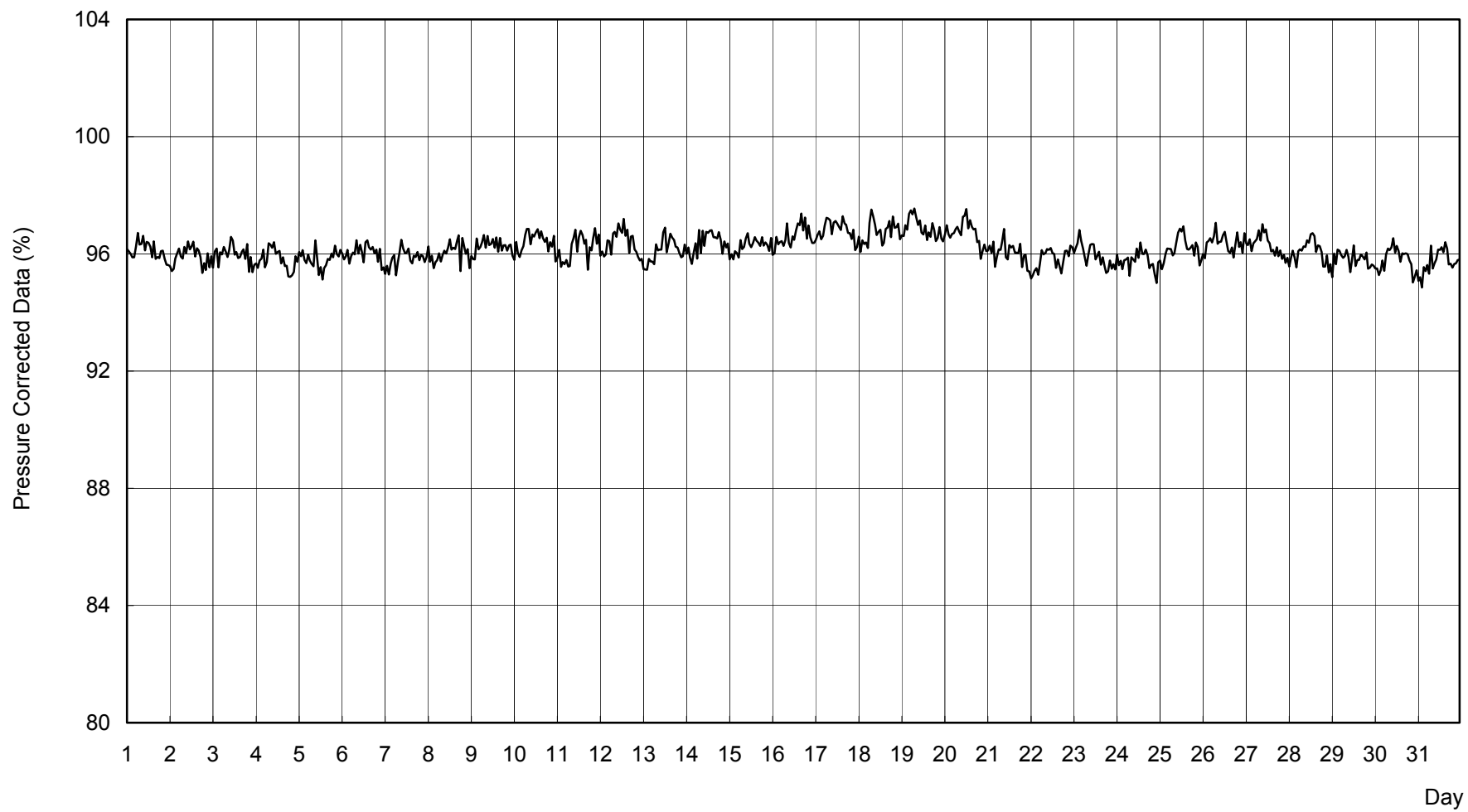




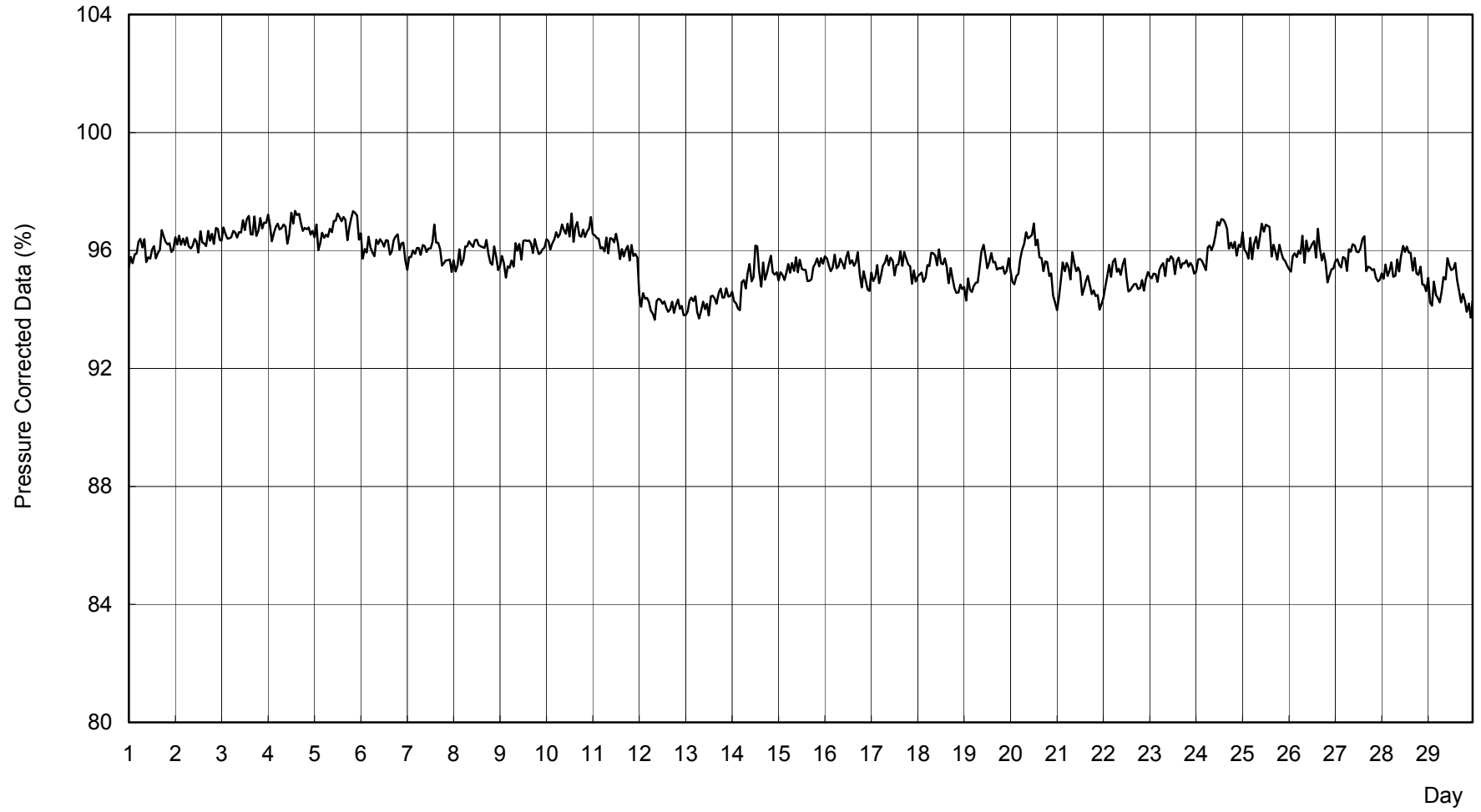
**S.V.I.R.CO. Observatory
Data Acquisition System**

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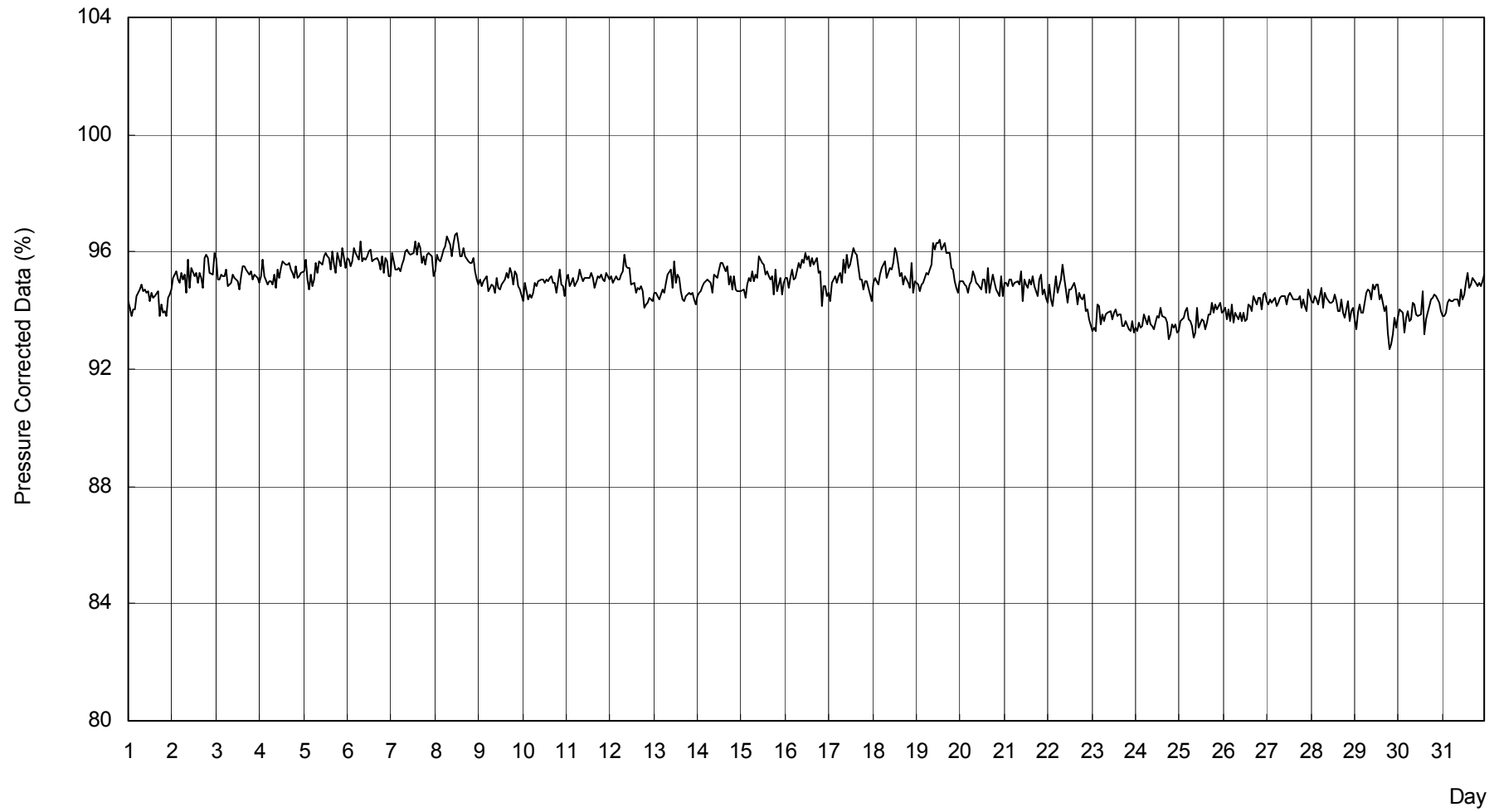
S.V.I.R.CO. Observatory - Pressure Corrected Data - January 2000



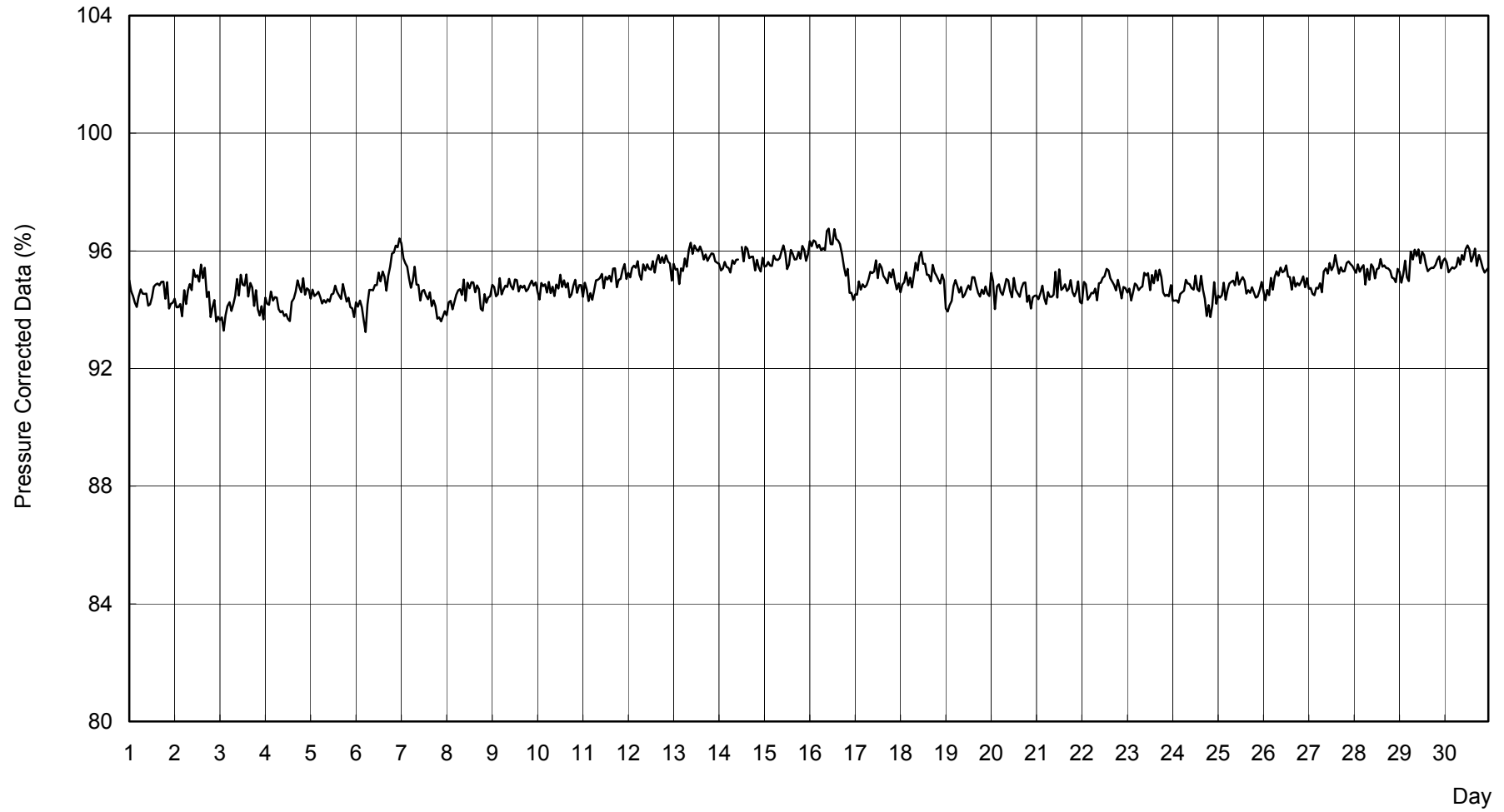
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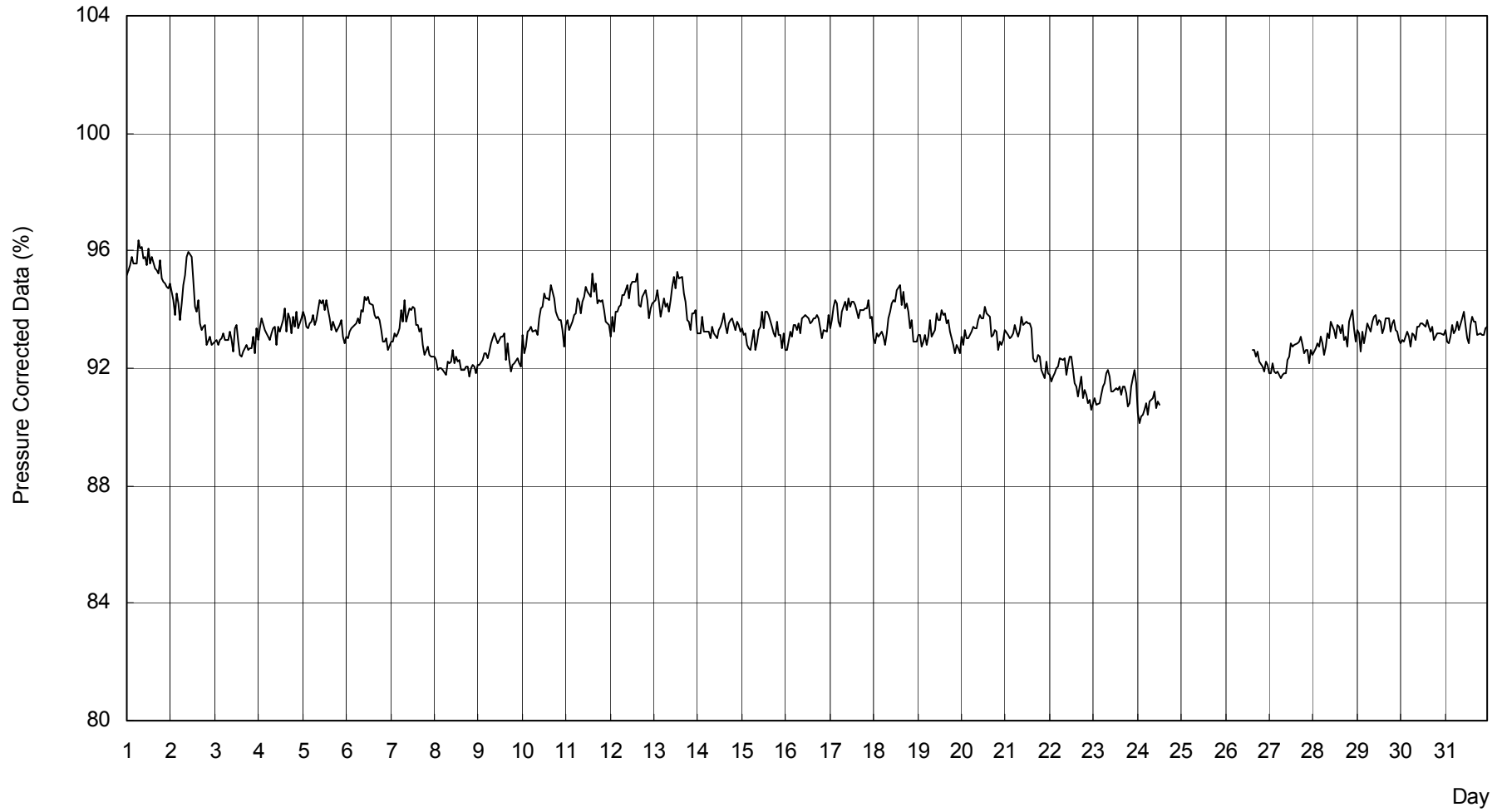
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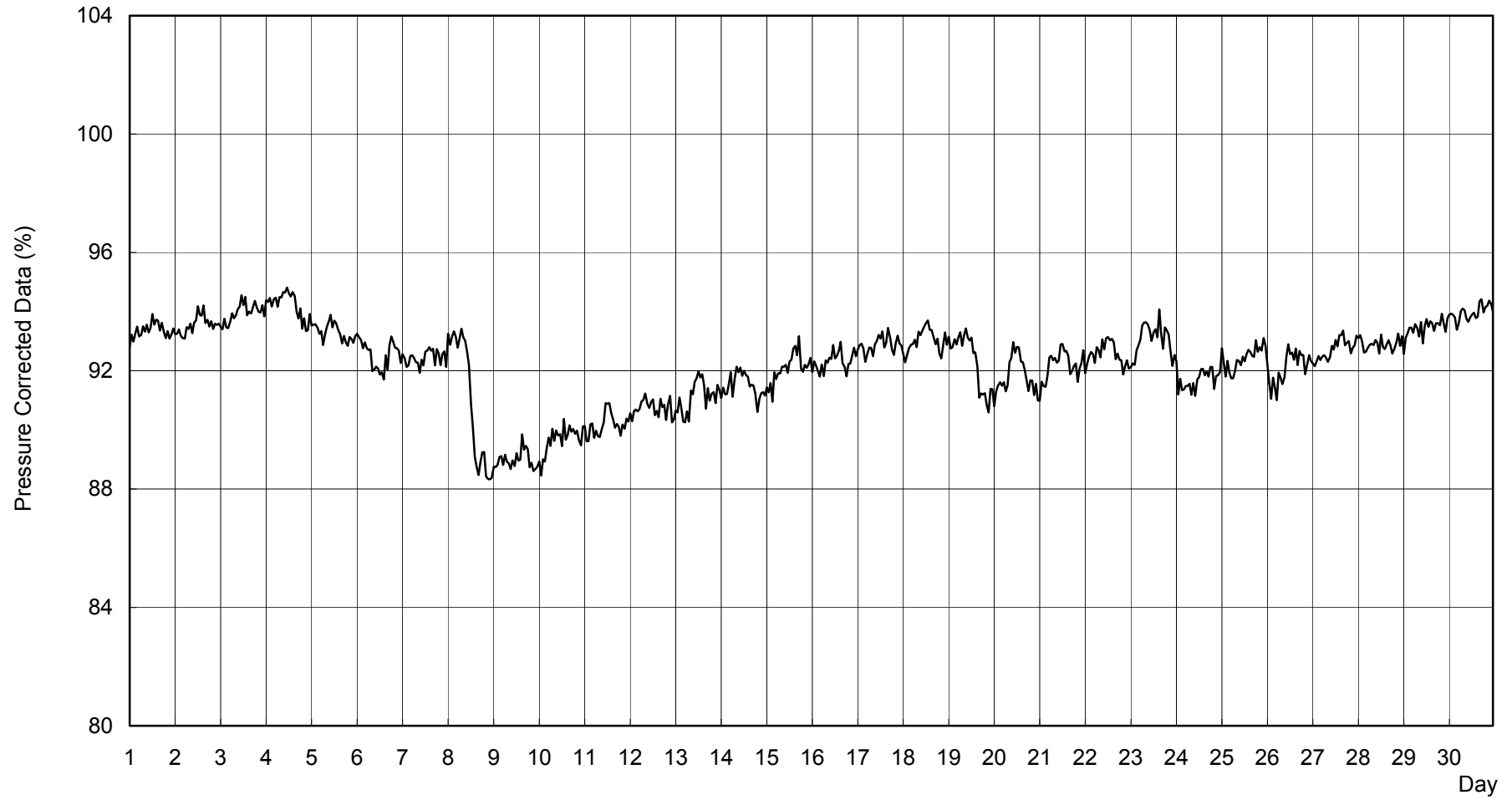
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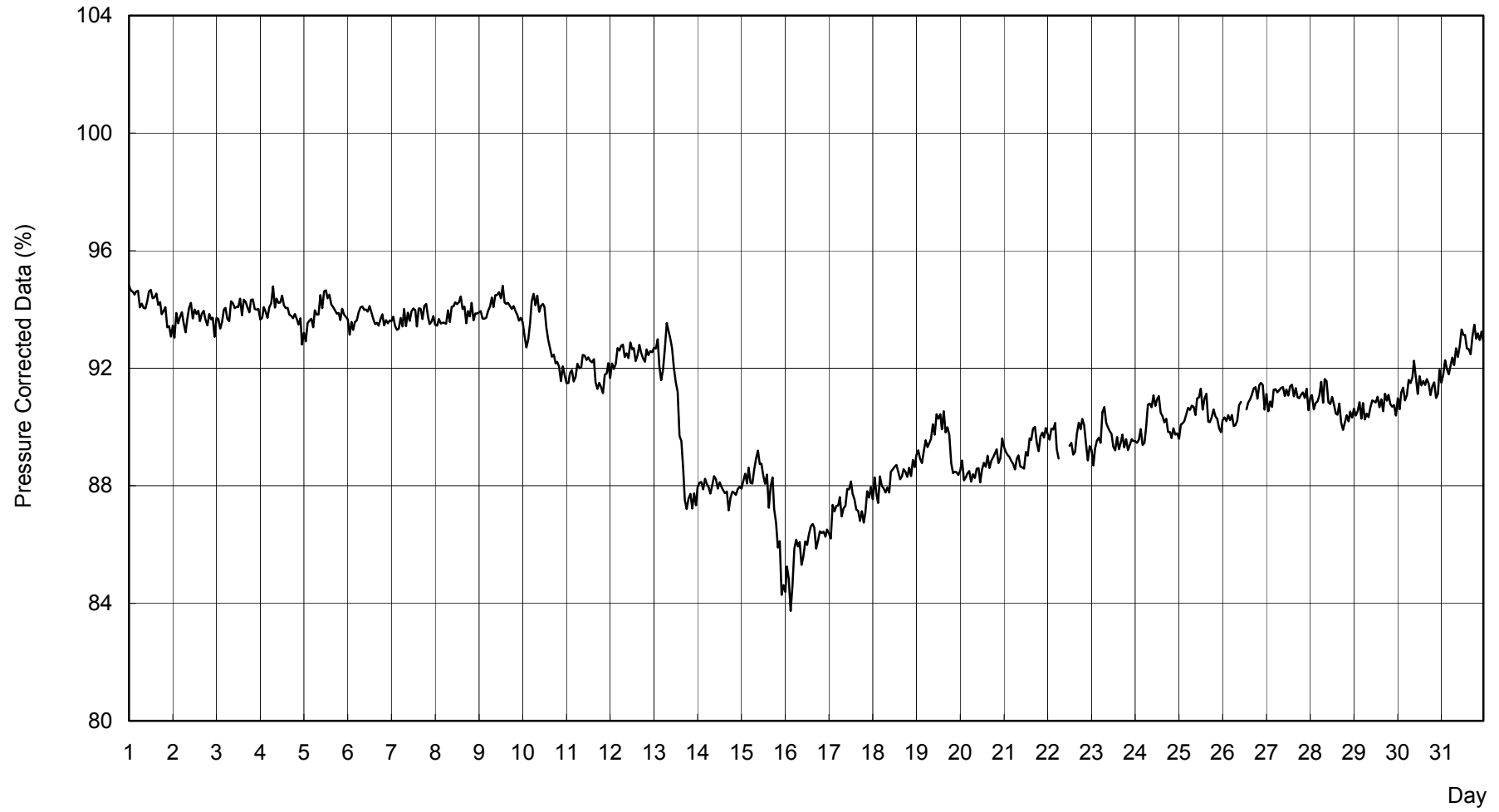
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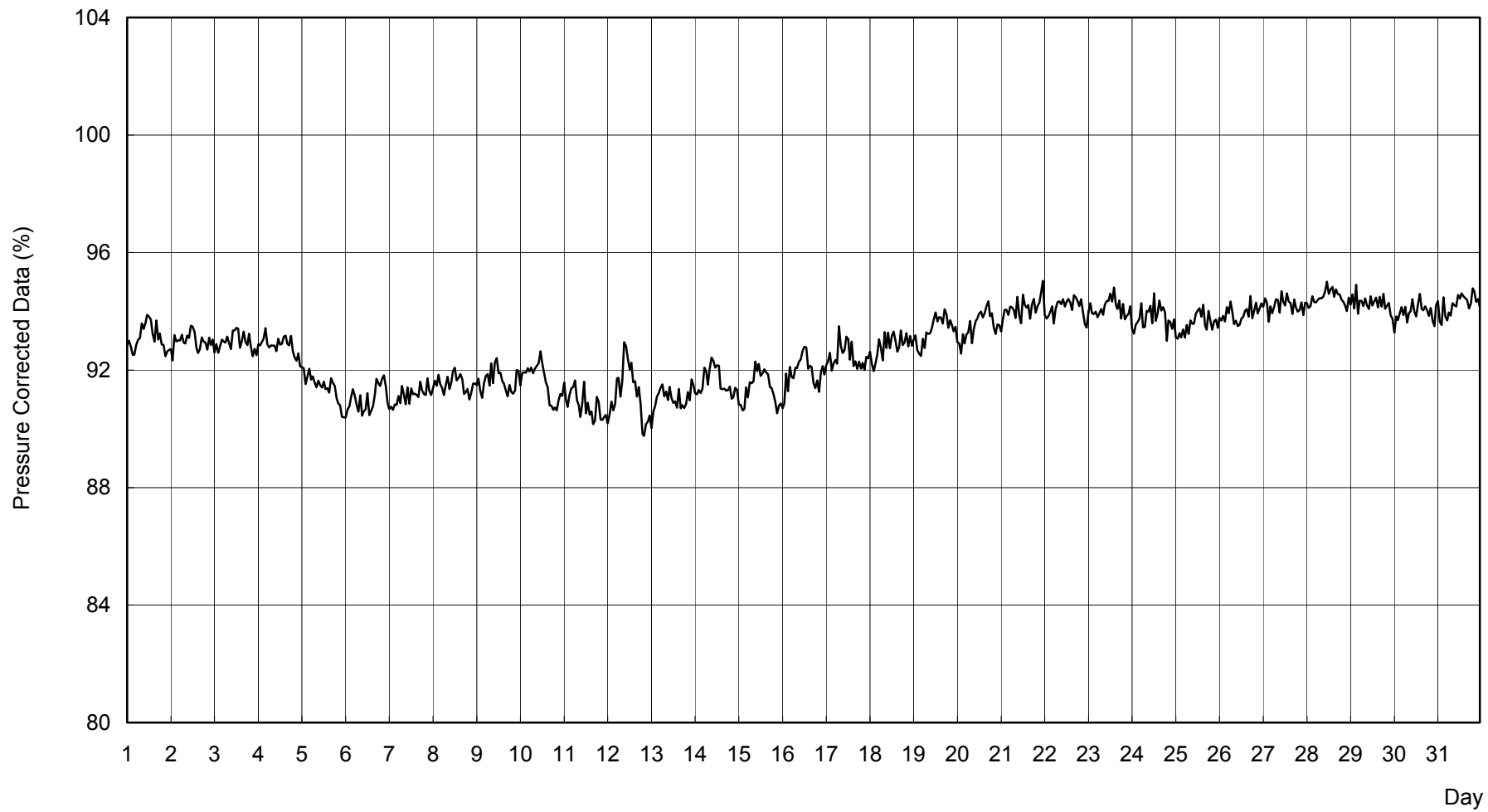
S.V.I.R.CO. Observatory - Pressure Corrected Data - June 2000



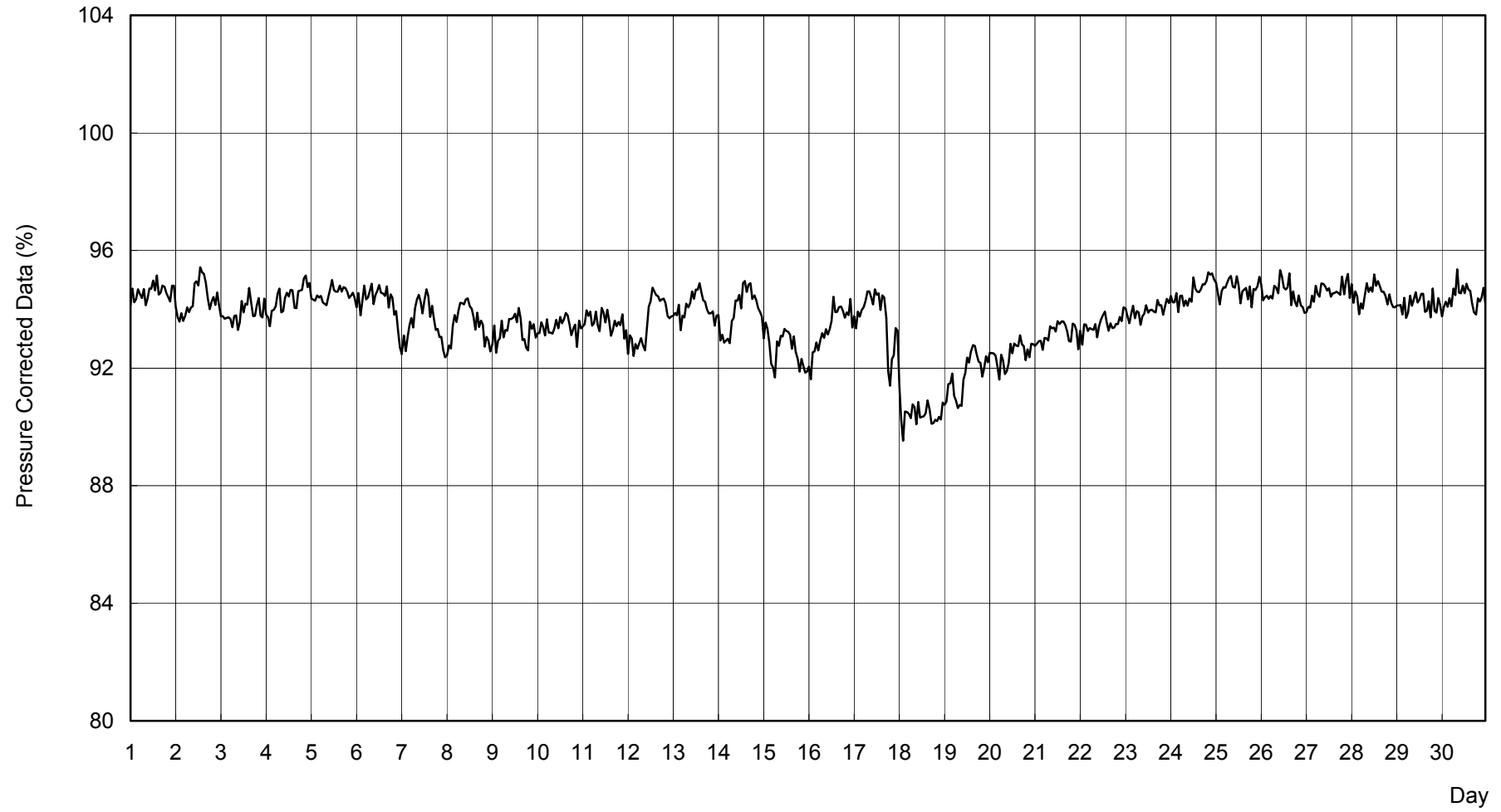
S.V.I.R.CO. Observatory - Pressure Corrected Data - July 2000



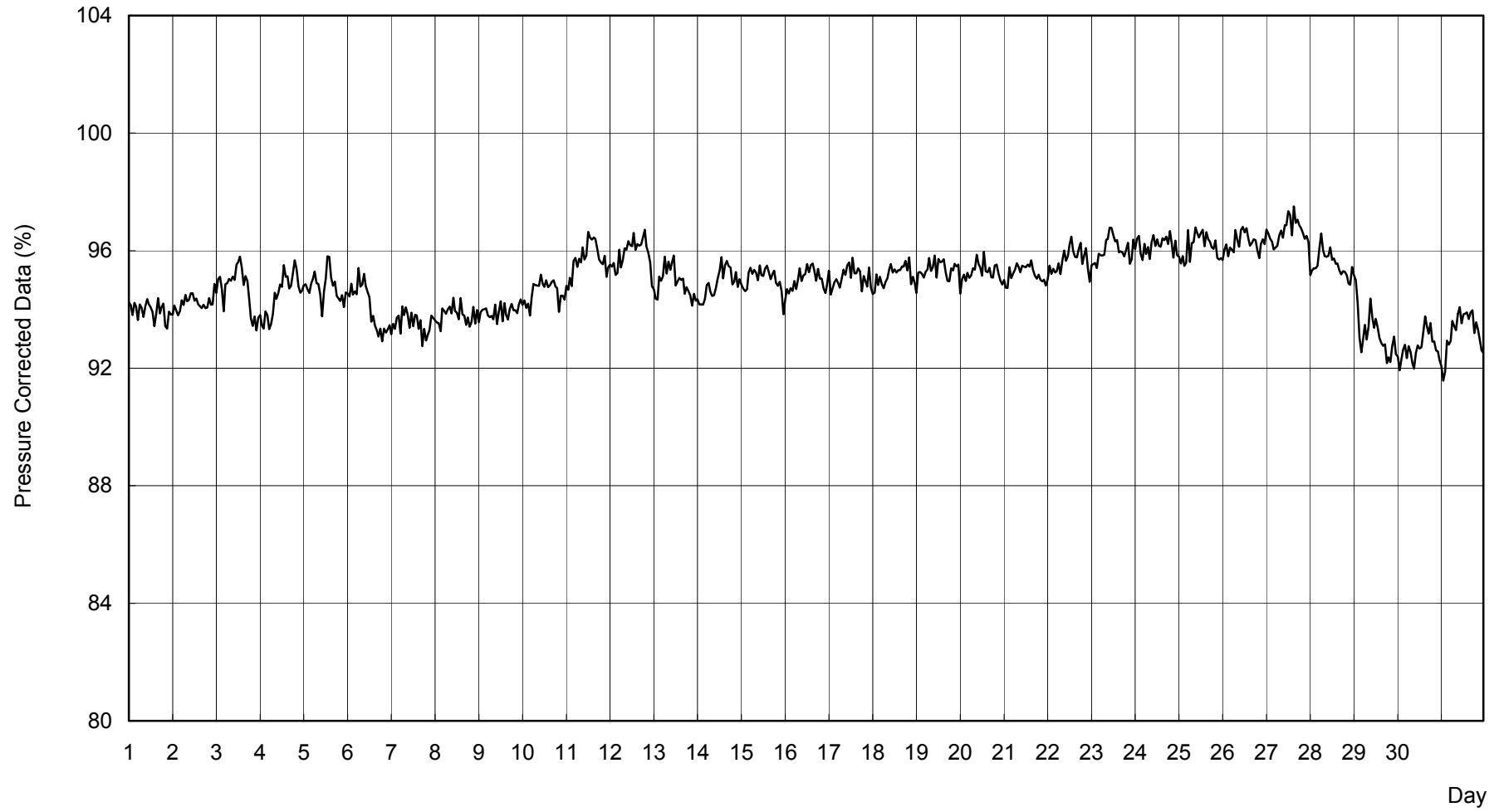
S.V.I.R.CO. Observatory - Pressure Corrected Data - August 2000



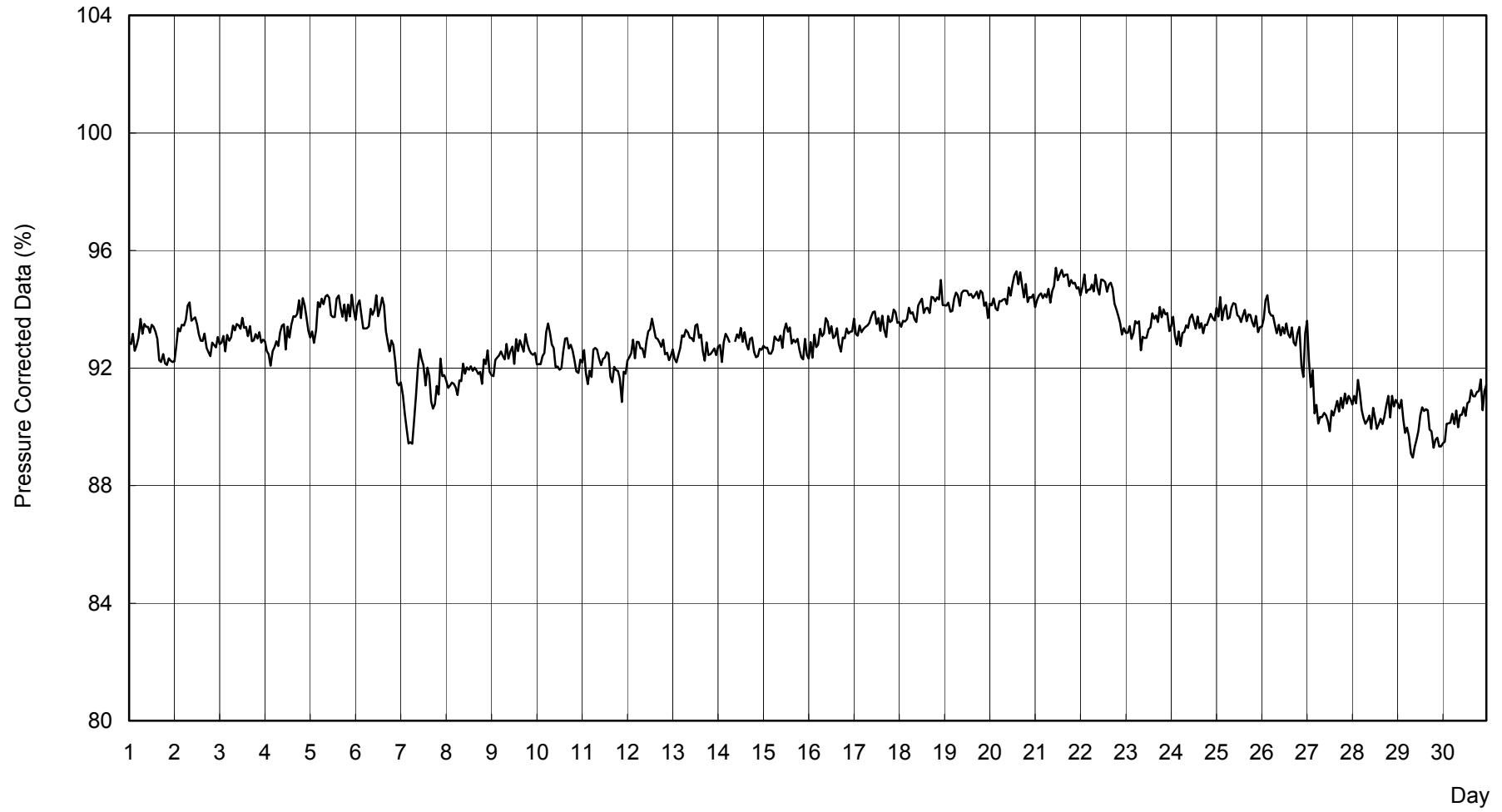
S.V.I.R.CO. Observatory - Pressure Corrected Data - September 2000



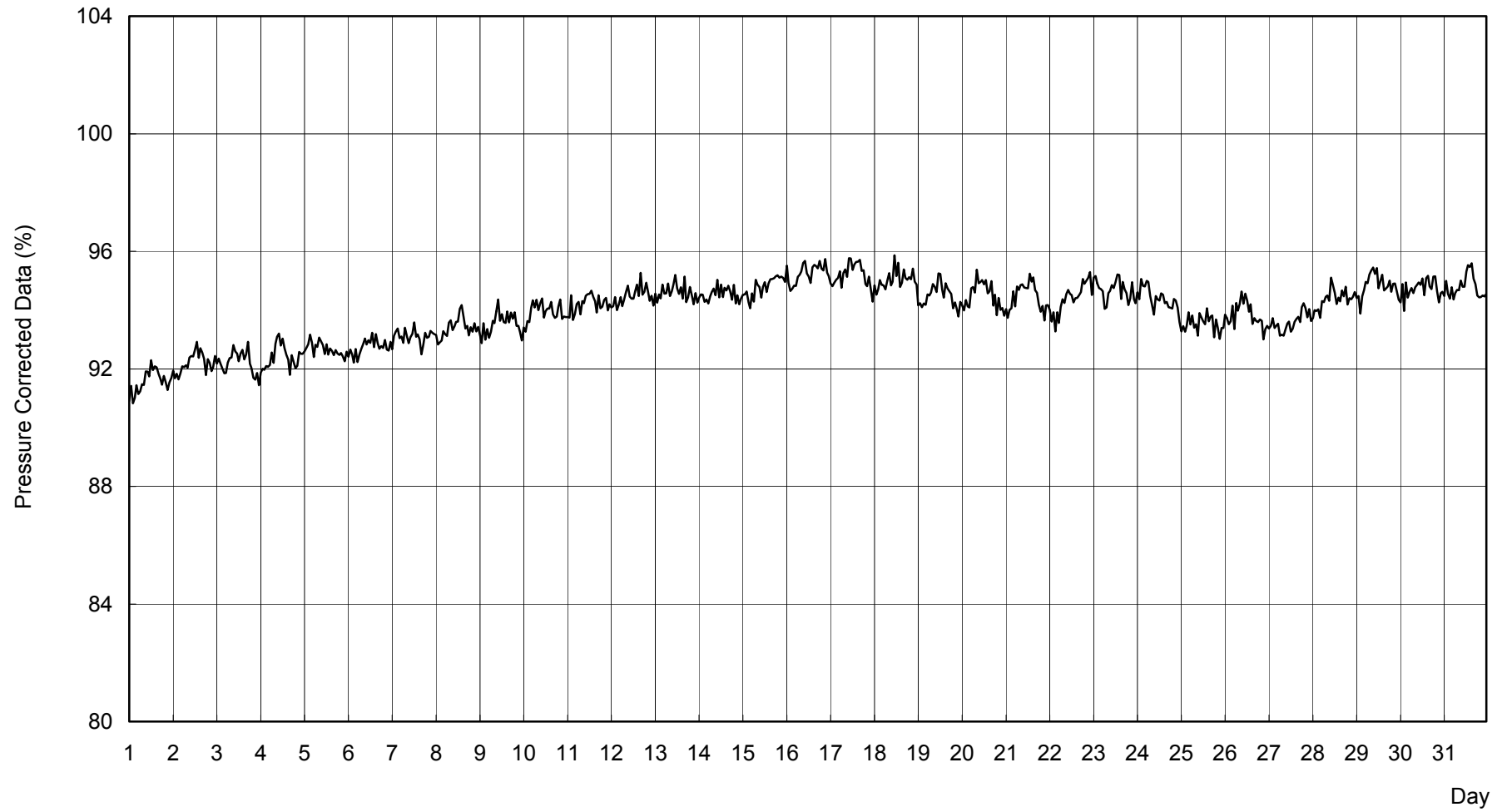
S.V.I.R.CO. Observatory - Pressure Corrected Data - October 2000



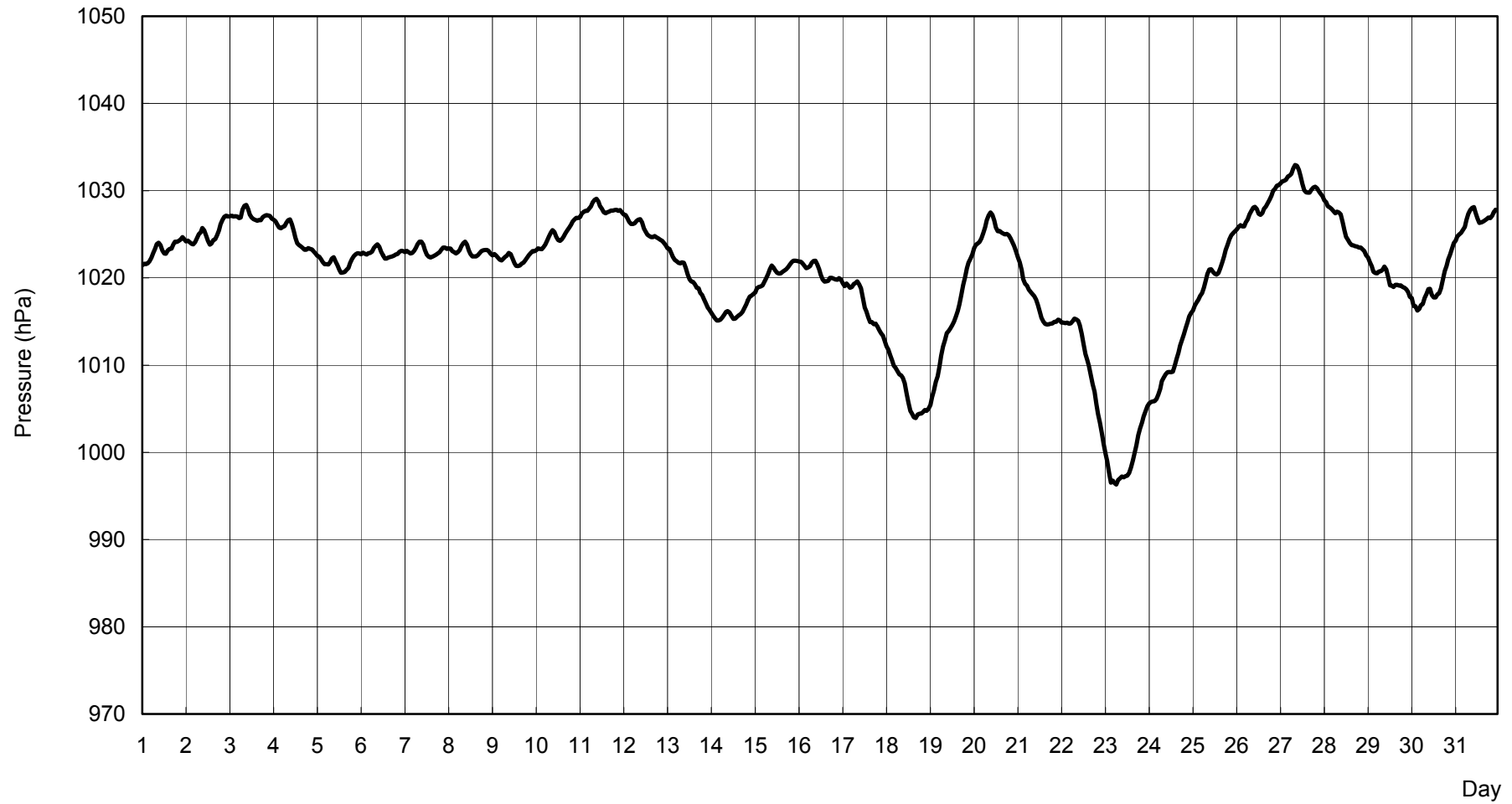
S.V.I.R.CO. Observatory - Pressure Corrected Data - November 2000



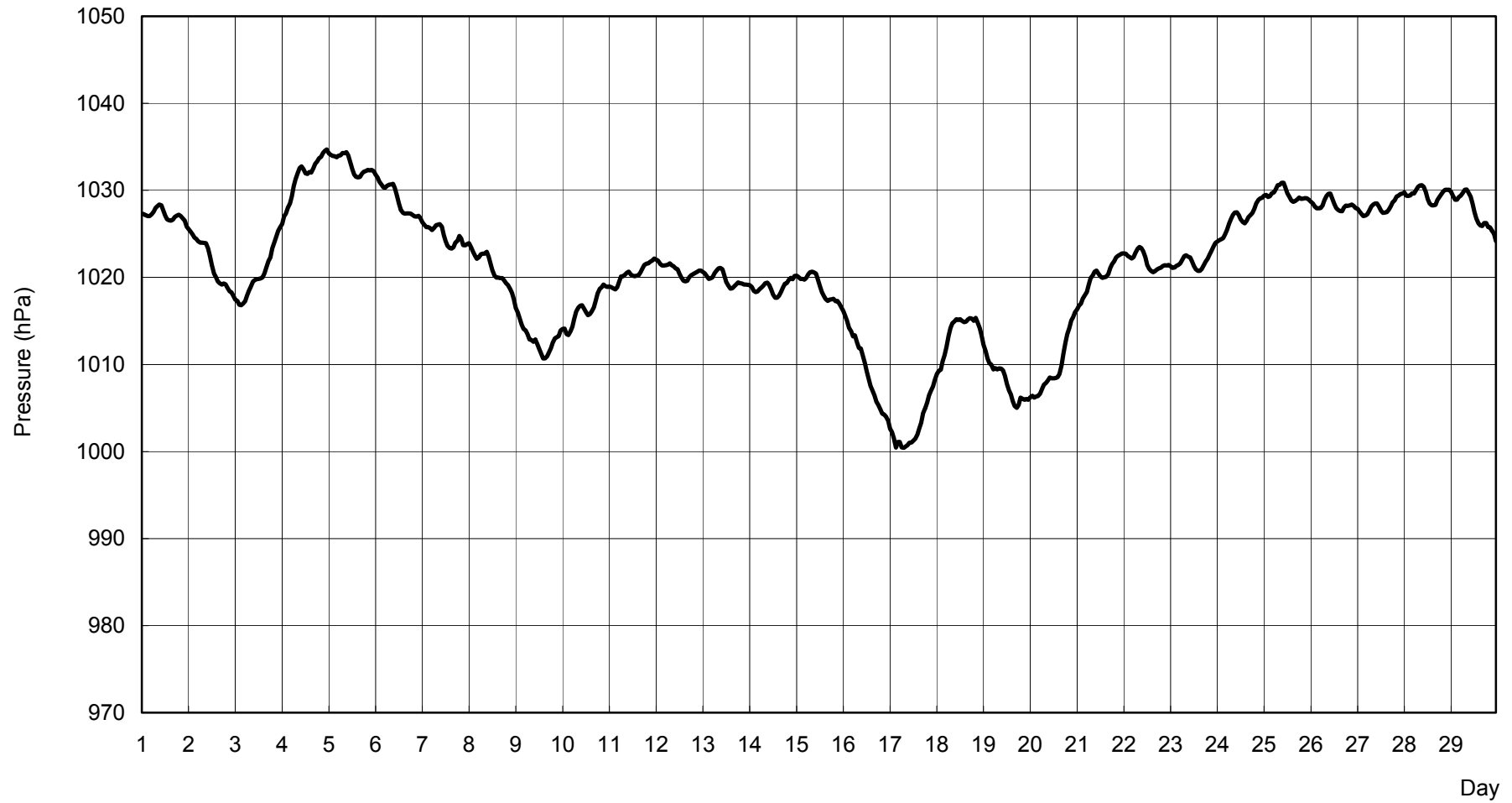
S.V.I.R.CO. Observatory - Pressure Corrected Data - December 2000



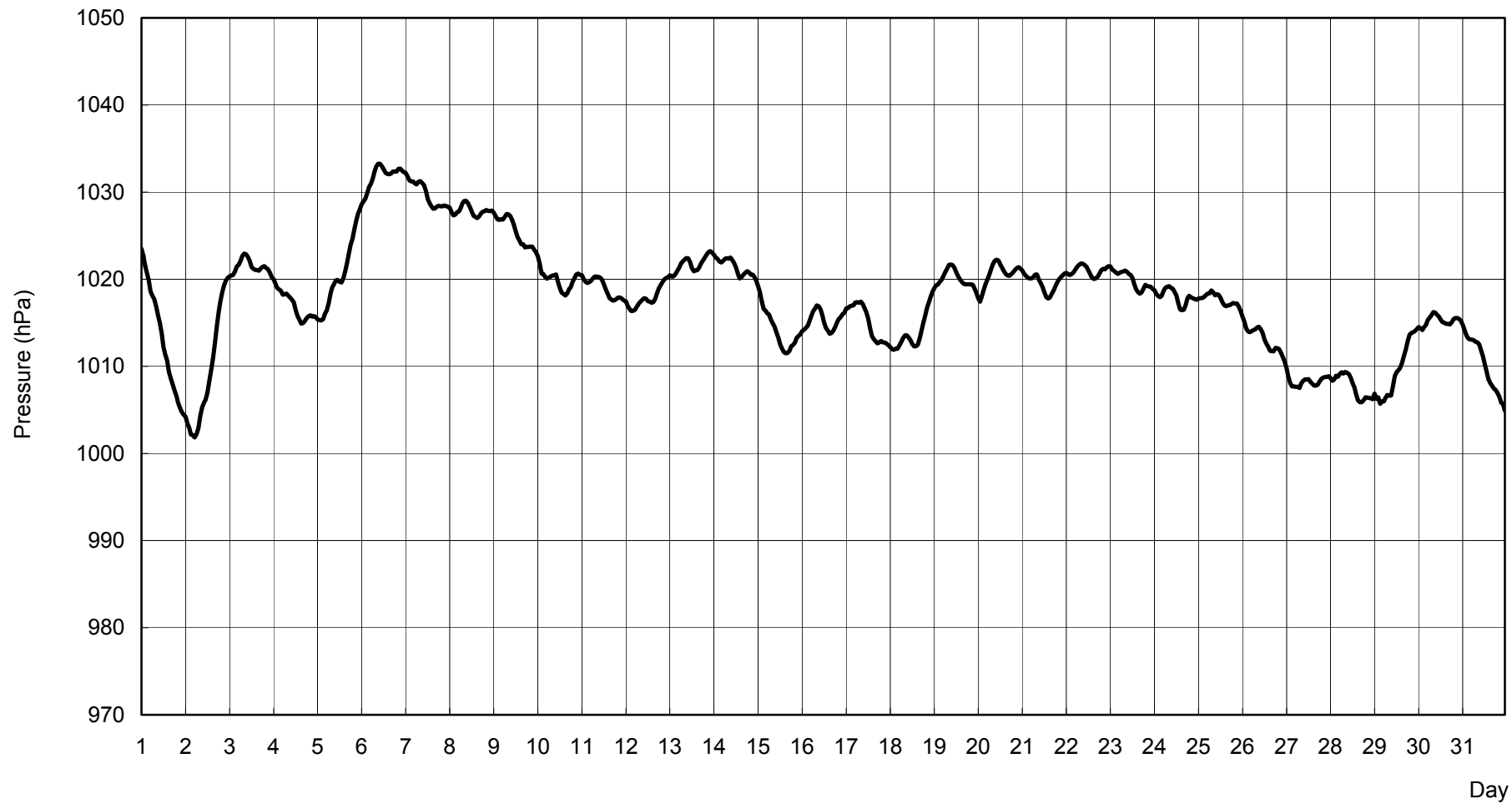
S.V.I.R.CO. Observatory - Pressure in hectoPascal - January 2000



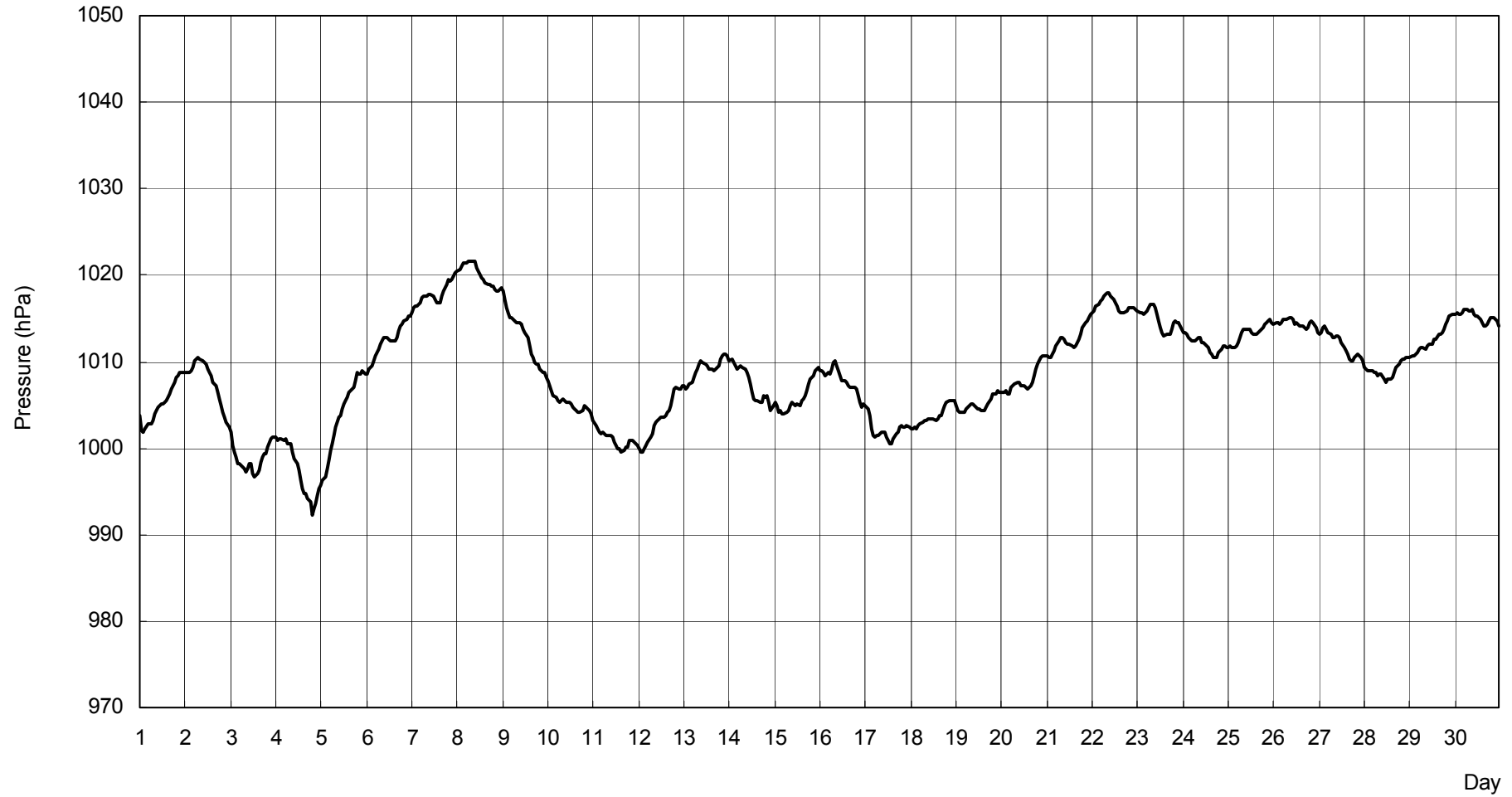
S.V.I.R.CO. Observatory - Pressure in hectoPascal - February 2000



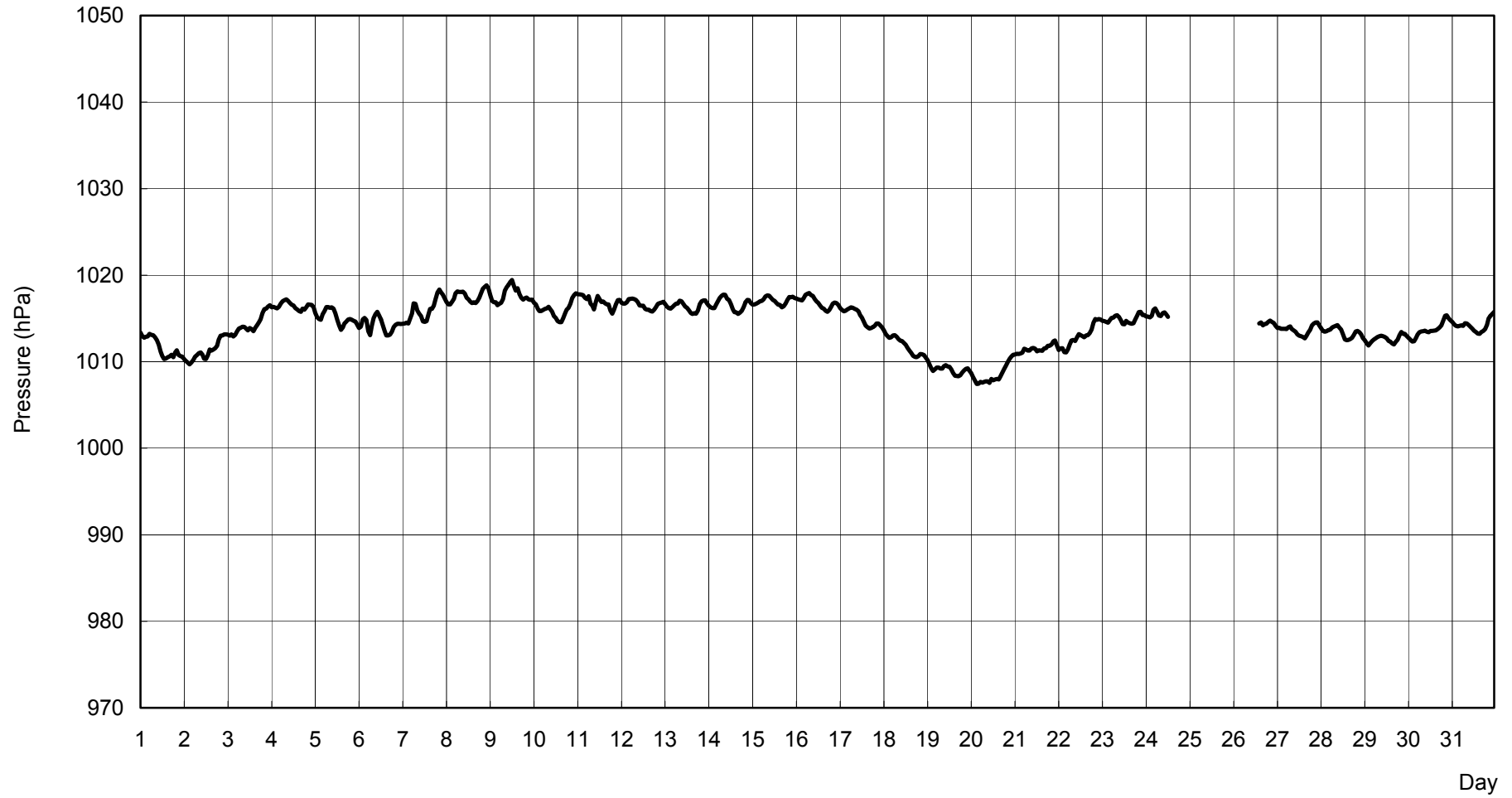
S.V.I.R.CO. Observatory - Pressure in hectoPascal - March 2000



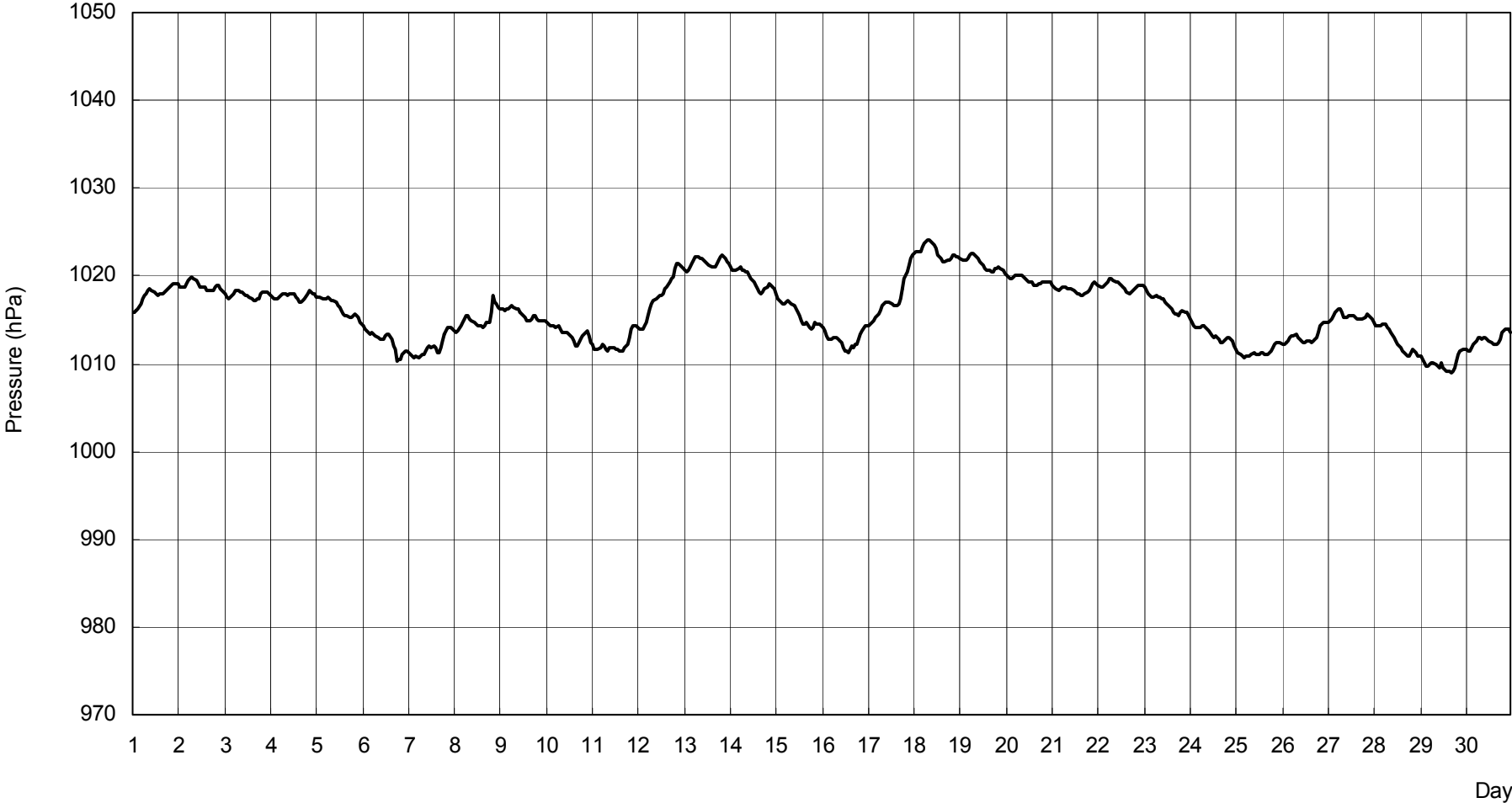
S.V.I.R.CO. Observatory - Pressure in hectoPascal - April 2000



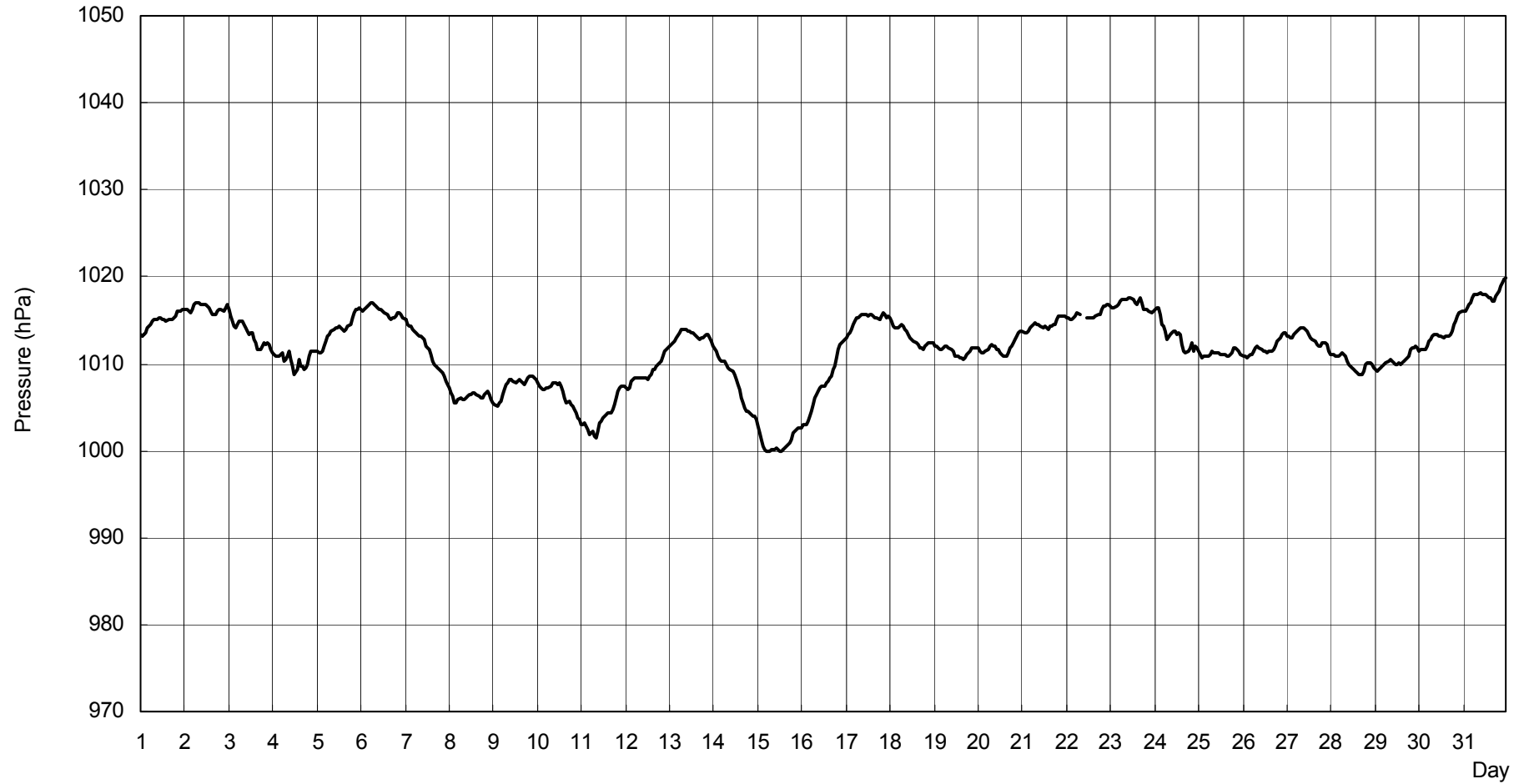
S.V.I.R.CO. Observatory - Pressure in hectoPascal - May 2000



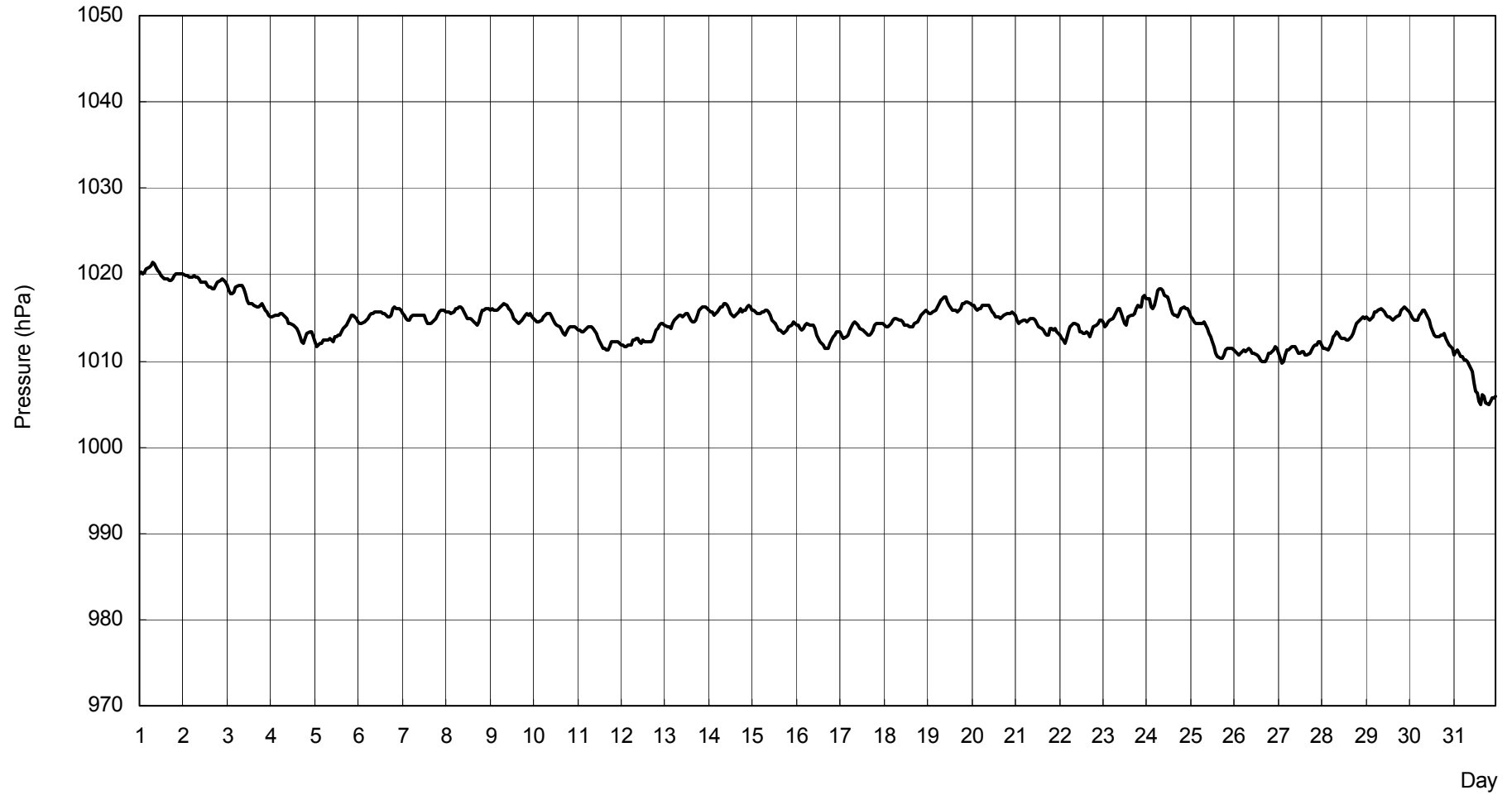
S.V.I.R.CO. Observatory - Pressure in hectoPascal - June 2000



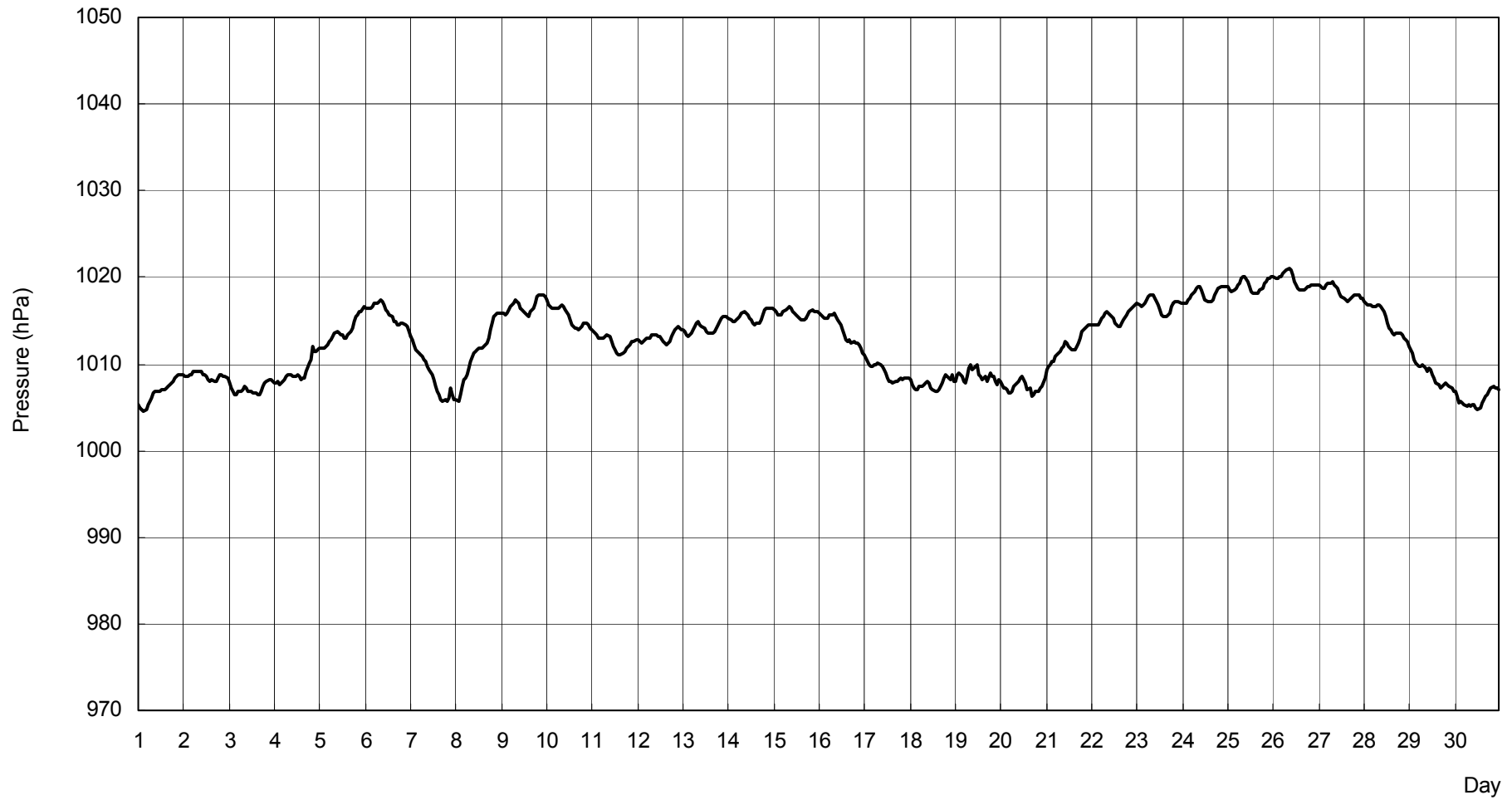
S.V.I.R.CO. Observatory - Pressure in hectoPascal - July 2000



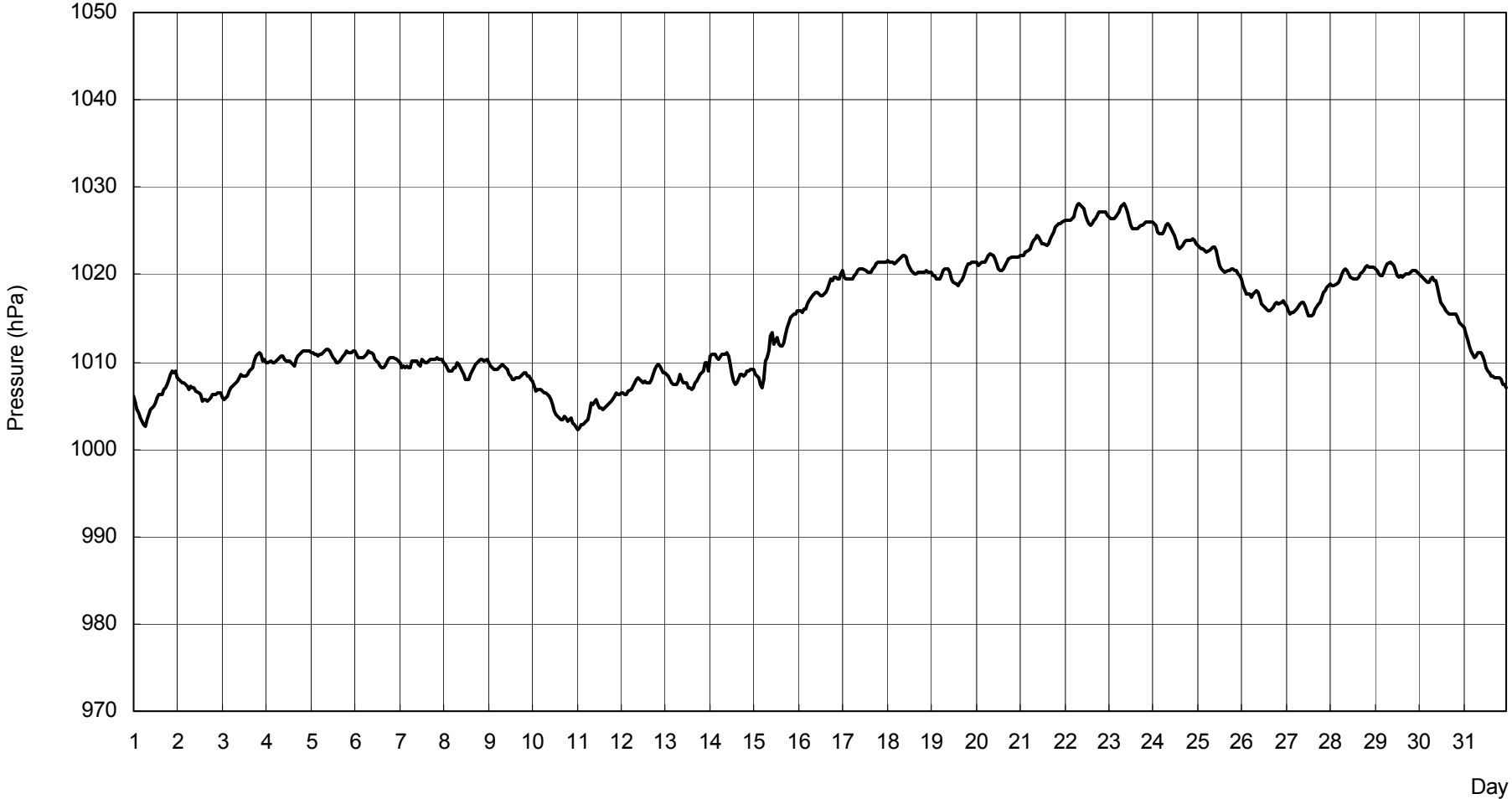
S.V.I.R.CO. Observatory - Pressure in hectoPascal - August 2000



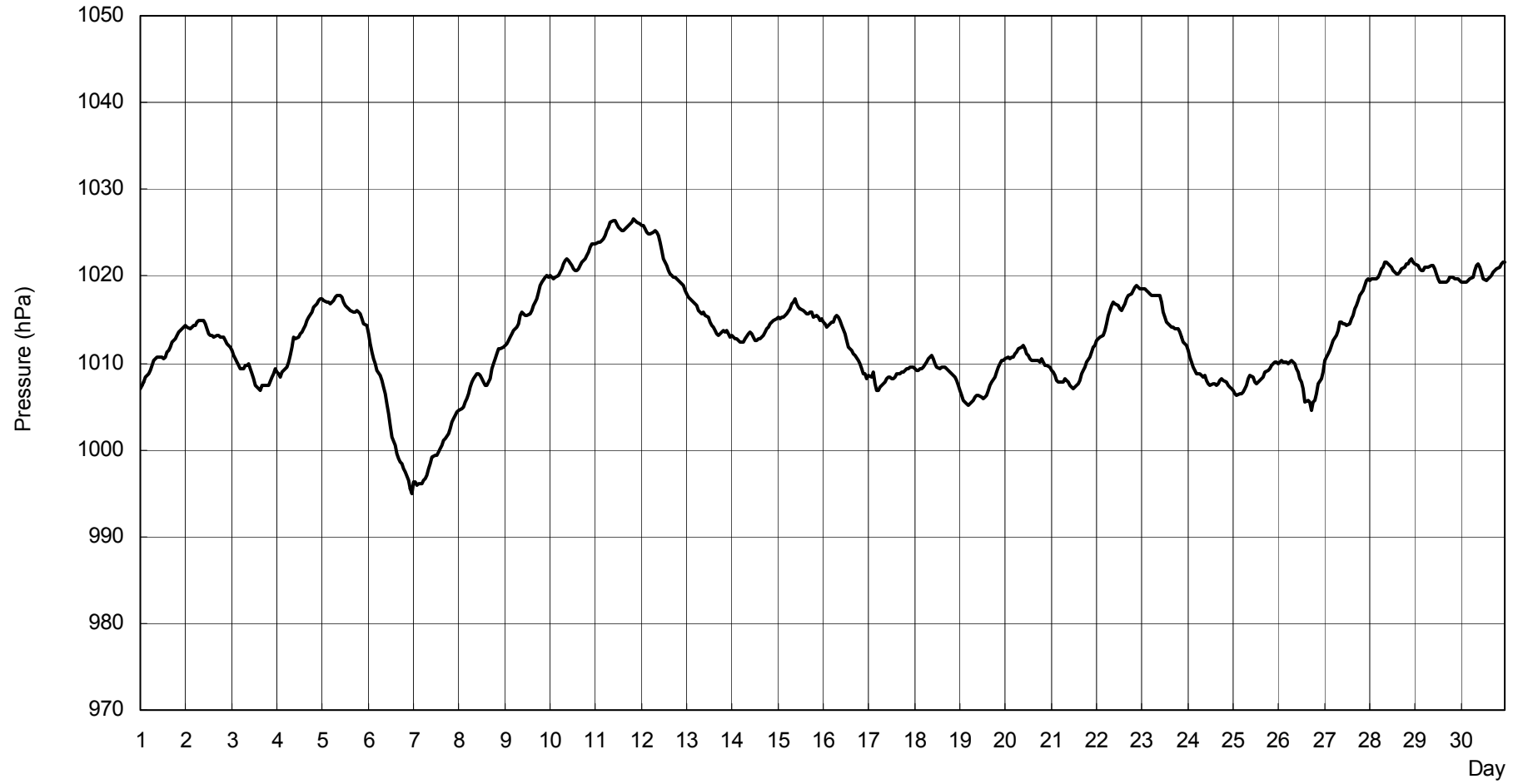
S.V.I.R.CO. Observatory - Pressure in hectoPascal - September 2000



S.V.I.R.CO. Observatory - Pressure in hectoPascal - October 2000



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