AN ATLAS OF CORONAL HOLE BOUNDARY POSITIONS MAY 28 TO NOVEMBER 21, 1973

J. T. NOLTE, A. S. KRIEGER,
American Science and Engineering, Cambridge, Massachusetts U.S.A.

A. F. TIMOTHY,
National Aeronautics and Space Administration, Washington, D.C. U.S.A.

G. S. VAiana, and M. V. ZOMBECK
Center for Astrophysics,* Cambridge, Massachusetts U.S.A.

(Received 27 October, 1975)

Abstract. This atlas shows the boundary locations of the coronal holes observed in soft X-rays (2-32, 44-54 Å) by the AS & E X-ray spectrographic telescope on Skylab. The data are presented as tracings of the boundaries as they appeared when the holes were near central meridian.

1. Introduction

The purpose of this brief report is to present data sufficient for the comparison of the low coronal manifestation of coronal holes, as seen in images taken by the AS & E X-ray spectrographic telescope, with other data from the Skylab period. In the photographic images taken with this telescope, coronal holes appear as regions of greatly reduced emission, bounded by emitting features. These data, and similar data from sounding rocket photographs, have been used to determine the physical conditions in coronal holes (Krieger et al., 1973), and the structure and evolution of coronal holes in the low corona (Timothy et al., 1975), and have been used to demonstrate the association of coronal holes with high speed solar wind streams (Krieger et al., 1973; Krieger et al., 1974; Nolte et al., 1976).

The instrument has been described in detail elsewhere (Vaiana et al., 1974). We merely note here that the instrument is sensitive to the soft X-rays which are the characteristic emission from the coronal plasma, at temperatures in excess of a million degrees, with a spatial resolution of 2" (~1400 km).

Due to a filter wheel failure, it was not possible to observe coronal holes with our instrument between November 27 and December 26, 1973. After December 26, there are images available until early February, 1974, but of poorer quality due to a shadow introduced by a misaligned shutter blade. For this report we have therefore included data only from the launch of Skylab (first data obtained May 28, 1973) through November 27. The last observation of a coronal hole central meridian passage was on November 21.

* Center for Astrophysics – Harvard College Observatory, Smithsonian Astrophysical Observatory.

Solar Physics 46 (1976) 291-301. All Rights Reserved
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2. Coronal Hole Boundaries

Coronal hole boundaries are most apparent in the longest exposure (256 s) with the thinnest filter (passband from 2–32 and 44–54 Å), because these exposures emphasize faintly emitting structures. A sample image, together with a tracing of the coronal hole boundary with a Stonyhurst disk overlaid, are shown in Figure 1.

The boundaries of coronal holes are usually well-defined and are marked on the tracing with a solid line. We have also indicated any prominent bright emitting features inside the hole boundaries by a solid line. An example is the active region centered at approximately 5°W, 6°N. Whenever there was a very faintly emitting region inside the well-defined limit of a hole, such as around 3°W, 12°S, or near the boundary of a hole (causing some ambiguity concerning the location of the boundary) such as near 7°E, 15°N, we have indicated these faint regions with dashed lines.

For this report, we have made no attempt to correct the boundary locations for projection effects. Timothy et al., (1975) have discussed projection effects for the simplified case of a radial boundary structure. The effects are important whenever the emitting material forming the boundary of the hole is between the observer and the hole. Thus, there is considerable uncertainty in the location of the southern boundary of the north polar hole, and in the northern boundary of the south polar hole. In this study, there are no significant effects for the low latitude holes because we have shown them near their central meridian passage (CMP) times.

The CMP days of all the coronal holes shown in this report are listed in the table. Coronal holes are numbered by location in heliographic longitude. Figures 2 to 7 show the boundary locations of coronal holes 1 to 6 respectively at CMP on each solar rotation on which the hole was seen. We have superimposed a Stonyhurst disk on each drawing, and indicated the day and time of each image used, together with the heliographic latitude and longitude at the time the image was taken. Dates are presented in a number system where January 1, 1973 equals 1.

<table>
<thead>
<tr>
<th>Hole</th>
<th>CMP Dates</th>
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<tbody>
<tr>
<td>CH1</td>
<td>May 31 (151), June 27 (178), July 25 (206), Aug 21 (233), Sept. 16 (259), Oct. 14 (287), Nov. 10 (314)</td>
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<tr>
<td>CH2</td>
<td>May 25 (148), June 22 (173), July 20 (201), Aug. 16 (228), Sept. 12 (255), Oct. 9 (282), Nov. 5 (309)</td>
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<tr>
<td>CH3</td>
<td>June 21 (172), July 17 (198), Aug. 13 (225)</td>
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<tr>
<td>CH4</td>
<td>Sept. 28 (271), Oct. 25 (298), Nov. 21 (325)</td>
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<tr>
<td>CH5</td>
<td>June 9 (160)</td>
</tr>
<tr>
<td>CH6</td>
<td>Oct. 20 (293), Nov. 16 (320)</td>
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