and observed in phase coherence during the last few years both in Crimea and at Stanford (Scherrer, Wilcox, Kotov, Severny, and Tsap 1979). Although the results are not inconsistent, their significance remains to be determined by a newly developed technique for evaluating the statistical uncertainty in a result of this type.

Figure 2 shows the power spectrum of the 5-day data sample. It reveals that the power in the 3 millihertz range (approximately 5 minutes) is resolved into many equidistant peaks, separated by 68 microhertz. Figure 3 is a representation on an expanded time scale of the average shape of certain lines.

The spectral peaks in figure 2 represent more than 40 spherical harmonics, the implications of which cannot be described in this brief report.

It is premature to undertake a comprehensive discussion of the theoretical implications of these new observations for models of the solar interior. However, there is no doubt that they will be profound.

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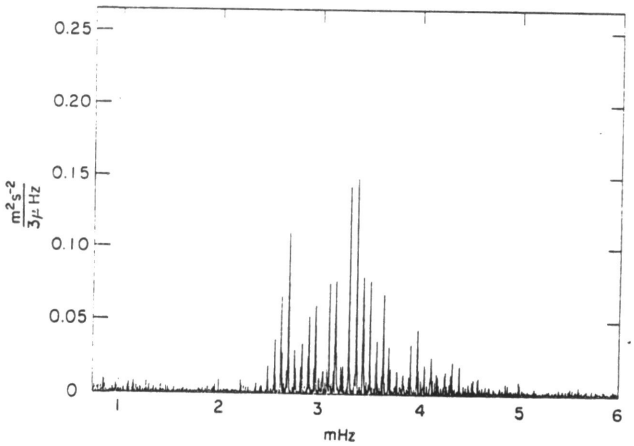

Figure 2. Power spectrum of the continuous 5-day full-disk Doppler shift measurements recorded at the South Pole from 31 December 1979 to 4 January 1980. The resolution of the power in the 3 millihertz (5 minutes) range into many discrete equidistant lines separated by 68 microhertz indicates that global p-modes, corresponding to a number of spherical harmonic terms, are observed. Note that the small peaks around 2.4 millihertz represent global oscillations with an amplitude smaller than 10 centimeters per second, corresponding to motion of the solar radius of a few meters, i.e., a billionth of $r_\odot$ (solar radius).

Reference

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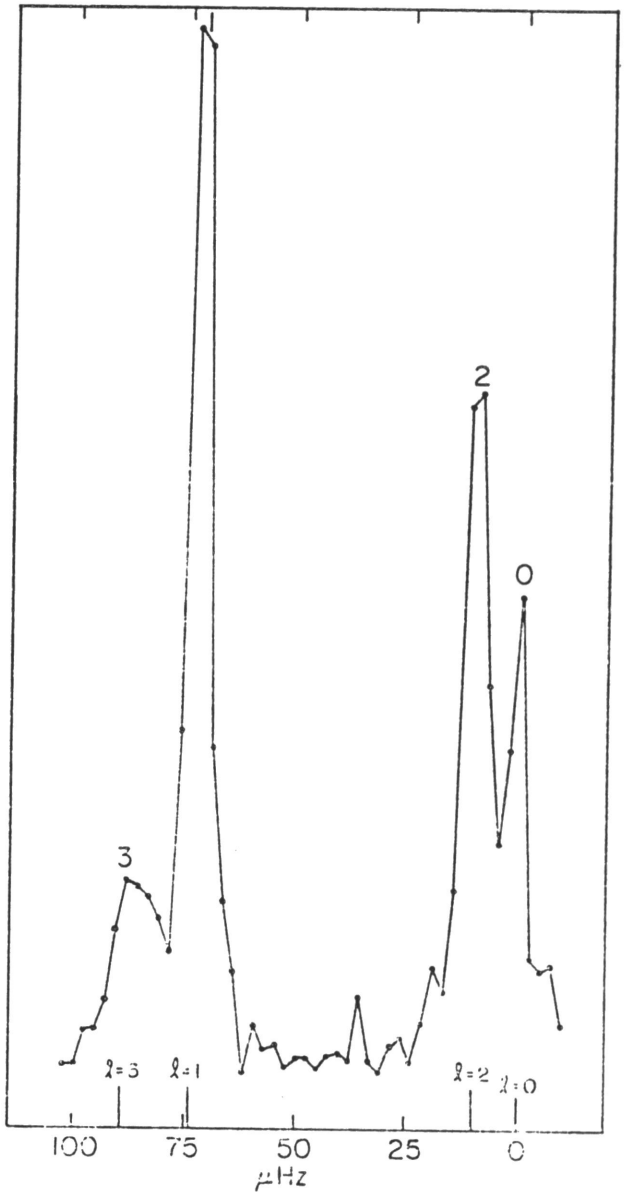

Figure 3. A superposed frequency analysis of the frequency range between 2.4 and 4.8 millihertz reveals the average shape of spectral lines displayed in the power spectrum of figure 2.

Two auroral arc systems

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All-sky photographs from the South Pole Station, together with those from the Defense Meterological Satellite Program (DMSP) satellites, have revealed that the auroral oval consists of the dayside and the nightside arc systems that are topologically distinct. An important implication of this result is that there are two dynamos in the magnetosphere.

After an extensive examination of a large number of auroral photographs taken simultaneously from the South Pole Station and from the DMSP satellites, Akasofu (1978) noted that the auroral arcs in the afternoon lie equatorward of the evening arcs. This work recently has been extended, and the results are illustrated schematically in the figure in which the composition of the auroral oval (in the northern hemisphere) is shown on the left-hand side; the right-hand side diagram is taken from Akasofu (1976).

As the figure shows, the dayside arc system has a radial alinement, emanating from the midday sector. From the nightside arc system, a single arc extends toward the afternoon sector. There is a distinct gap between the two arc systems, so that they are topologically distinct although they constitute a continuous annular belt, the auroral oval. All-sky photographs from South Pole Station have been extremely crucial in confirming the presence of the gap between the two arc systems, because it is often difficult to see the gap in the DMSP photographs. The oval of the two arc systems is surrounded by the oval of the diffuse aurora.

It is known that both dayside and nightside arcs are associated with "monoenergetic" electrons and are also likely to be related to field-alined currents. Thus, there is little doubt that the basic processes associated with the acceleration of auroral electrons for both arc systems are similar or identical. A dynamo process feeds the field-alined current, and the latter develops, in turn, the V-shaped potential structure. It is suggested that the dayside arc system is associated with the dayside field-alined current system driven by the low-latitude boundary layer dynamo on closed field lines, while the nightside arc system is associated with the nightside field-alined current system driven by the dynamo that arises from the solar wind blowing across the open field lines along the magnetotail. Details of this work will be published by Akasofu and Kan (in press).
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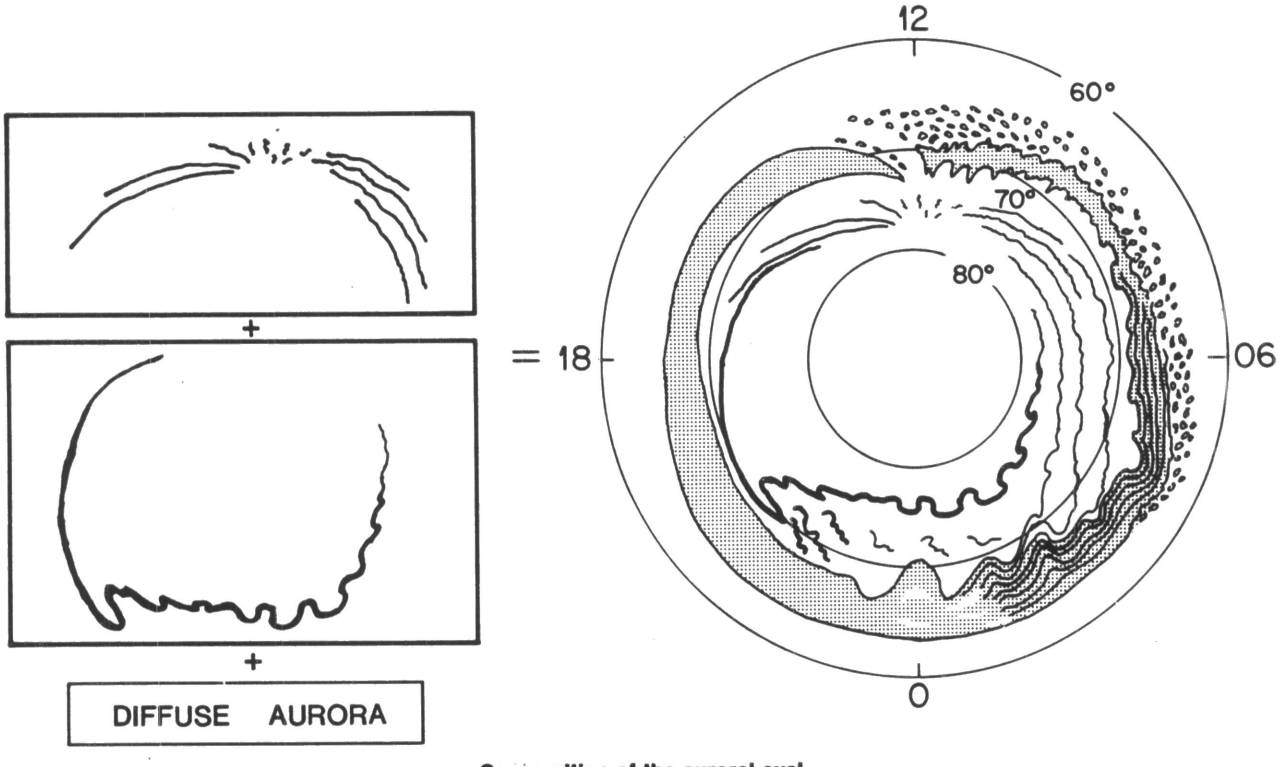

Composition of the auroral oval.