zone of solar activity at high latitudes separate from the Main Activity Zones (MAZ). Localized high-latitude intensity maxima are observed at 0.15 R_E above the limb throughout the solar cycle. They persist long enough at a given latitude to be visible in long-term (e.g., annual) averages and thus form High-latitude Activity Zones (HAZ). We identify two types of HAZ: Poleward-moving PHAZ, which we identify with the "Rush to the Poles" phenomenon seen in polar-crown prominences, appeared near latitude 60° in 1978 (possibly earlier at lower latitudes). In 1979 equatorward-moving HAZ branched off from the PHAZ (which continued on to reach the poles in 1990) near 70 to 80°. They evolved approximately parallel to the MAZ. Near solar minimum, the HAZ evolved into the MAZ of Cycle 22, and the emission continues its monotonous path toward the equator, where it should disappear around 1998. As of early 1992, it is clear that the patterns seem earlier is repeating. The PHAZ became apparent near the beginning of 1988 near 60° in the North and South hemispheres. The northern PHAZ reached the pole during late 1989 to 1990, and solar emission effectively ceased at the end of 1990. The southern PHAZ moved more slowly, and the southern-most emission regions reached the pole in mid-1991. South-polar emission was still occurring as of the latest observations. The HAZ that are the precursors of sunspot Cycle 23 became clearly established in the Northern hemisphere near the beginning of 1990 at approximately 70°. Currently the zone is at about 55°. The appearance of the HAZ in the South was less dramatic but probably began in mid-1990 near 70°. Its current position is also at about 55°. These recent observations increase the evidence for parallel overlapping solar phases that begin every 11 years but last for approximately 19-20 years.

11.07
Scattering of Radio Waves in the Solar Corona
T. S. Bastian (NRAO)

Over the past two decades, our understanding of turbulence in the solar wind and the corona has progressed significantly. Coupled with this have come many important developments in the theory of radiation transport in random media. While the importance of scattering of radio waves at meter wavelengths emitted by sources embedded in the solar corona has long been recognized, the formalism used to describe the scattering has not been brought up to date. In this paper I point out several developments which modify and extend our understanding of scattering of radio waves in the solar corona. Specifically, I show: (i) the importance of scattering of radio waves emitted by sources embedded in the solar corona extends to microwaves; (ii) the potential importance of refractive scintillation at meter wavelengths. The practical consequences of these developments are briefly explored.

Session 12: Solar Magnetic Structure and Observation
Oral Session, 10:00-11:30 am
Union C/B

12.01
First Results from the Advanced Stokes Polarimeter
B. W. Lites (HAO/NCAR), R. B. Dunn (NSO), D. F. Elmore, S. Tomczyk, A. Skumanich, K. V. Streander (HAO/NCAR)

The Advanced Stokes Polarimeter (ASP) is a collaborative program between the High Altitude Observatory (HAO) and the National Solar Observatory (NSO) to investigate the physics of solar active regions through quantitative measurements of vector magnetic fields. First scientific results from the ASP were obtained during an observing run in March, 1992, when high resolution Stokes profile maps of active regions were obtained under good seeing conditions. The ASP measures simultaneously the full Stokes profiles in photometric Fe I lines near 630 nm and in the temperature minimum/low chromospheric Mg I b-lines at 517 nm. We present scans of an isolated small sunspot near disk center, and we discuss the line structure of the vector field within this sunspot and in the magnetic elements surrounding it. Observations of a complex active region near the east limb will also be presented. This active region produced a flare during the observational sequence.

12.02
Infrared Determinations of Magnetic Profiles in Sunspots
G. Kopp (NSO), J. Kuhn, H. Lin (Mich. State), D. Rabin (NSO)

We present measurements of a sunspot using uncalibrated observations of the magnetically-sensitive (Landé g=3) Fe I line at λ=1.5649 μm (6388.6 cm⁻¹). We compare the magnetic field profile from this fairly symmetric spot with model profiles. Splittings in this infrared line are nearly a factor of 3 greater than in a comparable visible line, since Zeeman splitting as a fraction of linewidth increases linearly with wavelength. The infrared is also less affected by stray light than the visible, because the intensity contrast is reduced, decreasing the effects of stray light, and because instrumental scatter is lower in the infrared. The combination of the magnetic and stray light advantages of the infrared and the recent availability of "large" infrared arrays has made possible more sensitive determinations of the magnetic field profile throughout sunspots. From observations of several sunspots, we find that the magnetic field strength, determined in the strong field regime, is not a smooth function of radius from spot center, and that single radial parameter models do not accurately describe the observed spots.