1.05
Infrared Imaging of Faculae at the Deepest Photospheric Layers
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We have used the IRTF 58 x 62 InSb array and the McMath telescope to image the deepest photospheric layers of three active regions at the 1.634 μm opacity minimum. At 1.634 μm, faculae are dark relative to the photosphere, with a measured contrast of at least 2% at positions on the disc by approximately 0.75<λ<1.0. Near the limb, at λ<0.3, they are brighter than the photosphere, as in the visible. At intermediate 0.5<λ<0.75 they are difficult to detect at 1.634 μm. The fact that faculae and their immediate surroundings exhibit a clear deficit of T<sub>k</sub> near disc center at 1.634 μm is also not easily explained by existing "hot wall" models of these structures. It appears from these new IR data that a "hot cloud" of appreciable 1<sup>12</sup>C opacity plays an important role in facular structure. We also discuss the imperfect spatial correspondence found between dark faculae and bright CaK plage in terms of possible differences in size between photospheric flux tubes that give rise to CaK plages.

1.06
New Observations and Analysis of the Helium D3 Shell above the Limb
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Subtractive imaging has been applied to accurately determine the radial variation of the emission just above the limb in the D3 line of He I near 5876 Å. Calibrated observations were made by S. Koutchmy at the Vacuum Tower Telescope at NSO-Sacramento Peak Observatory using the Universal Birefringent Filter in the 1/4 Å mode (0.165 Å FWHM at 5876 Å), and computer-controlled exposures on 2415 film. High spatial resolution frames were selected for analysis. The continuum image 3.5 Å from line center was subtracted from the image at D3. We show the results for a polar region associated with a well developed coronal hole.

The narrow band of D3 emission is located at about 1800 km above the limb. The emission band is fainter in coronal hole regions, and shows patches of brightness on the same scale as chromospheric inhomogeneities. An inner shell very close to the limb also appears in the subtractive imaging.

These observations have been compared with chromospheric model calculations that include illumination of the chromosphere by coronal lines in the He I continuum shortward of 504 Å. The chromospheric emission near 1800 km can be reproduced given sufficient coronal illumination. However, the inner shell is not easily explained. We present results using chromospheric models for both quiet and active regions, and a range of values for the brightness of coronal lines.

1.07
Simultaneous Microwave and Soft X-ray Observations of Active Regions at the Solar Limb
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Using the Very Large Array (VLA) at 6 and 20 cm, along with simultaneous measurements made in soft X-rays with the Flat Crystal Spectrometer (FCS) aboard the Solar Maximum Mission (SMM), we have studied two active regions near the solar limb. The X-ray emission from plasma at a temperature of 3X10<sup>6</sup> K is found to occur at greater heights than the radio emission: it peaks at a height of at least 20000 km. There is some degree of similarity between the images in soft X-rays and at 20 cm wavelength, in that both show peaks above the active regions, and an extended bridge of emission 200 000 km long joining the two regions. However, this bridge is much more pronounced in the radio maps than in soft X-rays. Since the radio emission has a brightness temperature well below that of the X-ray material, it is probably optically thin. The 20 cm emission originates from lower altitudes than the X-ray material and in the region between the two active regions. At 6 cm wavelength, the emission is concentrated at low altitudes, where the X-ray emission is relatively low. Comparison of the 6 cm map with the potential magnetic field lines computed from photospheric magnetic field suggests instead that the 6 cm emission is associated with regions of stronger fields, thus providing evidence for gyrosionce emission.

1.08
A Search For Periodicities in the Occurrence Rates of Ottawa 2.8 GHz Solar Burst Data, 1955-1986
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The discovery by Rieger and his co-workers of a 154-day periodicity in the occurrence rate of SMM gamma-ray events observed from 1980-1982 has prompted other investigators to search for similar periodicities in energetic phenomena from earlier solar cycles. Thus the 154-day period was subsequently detected in microwave burst data during cycle 20 (1965-1976) and a 51-day period that may be a harmonic of the 154-day period was detected in comprehensive flare index data for solar cycle 19 (1955-1964). It was advantageous to search for such periodicities using a homogeneous data set - the Ottawa 2.8 GHz burst data set is a good candidate. These data have been recorded continuously since 1947 and encompass three complete cycles. We have made a spectral analysis of the Ottawa burst data using both Fourier transform and maximum entropy techniques. A peak at 154 days is a prominent feature in the periodograms for cycles 21. There is little, if any, evidence for such a period in the Ottawa data for cycle 20 for events with S<sub>6>50</sub> s<sub>f</sub>, > 160 s<sub>f</sub>, or > 200 s<sub>f</sub>. To test this result, we consider other, somewhat less-sensitive, samples of energetic flares from cycle 20. A peak at 51 days is observed in the cycle 19 data, for events with S<sub>6>200</sub> s<sub>f</sub>.

1.09
Relationships Between Active Region Emissions at 2.8 cm and Indicators of Dynamic Processes
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During the period 1-13 November 1981, the 46m radio telescope at the Algonquin Radio Observatory was used to monitor the intensity and position of emission centres in active regions as they evolved from day to day. In general the emission centroids were located close to major magnetic polarity reversal lines. The brightness of the sources is not simply related to plage area, or to sunspot area or number, suggesting that models based simply upon time-independent magnetic flux or plasma density are not appropriate.

To relate the intensity of the sources to dynamic processes in the host regions or complexes of activity, two empirical parameters