SUMER를 이용한 태양 AV 방출선 윤곽의 분석 연구

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SOHO(Solar and Hemispheric Observantly) 과학위성의 고분선 분광기 SUMER(Solar Ultraviolet Measurement of Emitted Radiation)로 관측한 정온 태양의 UV 방출선(Ne VII 770.40Å, Si IV 1393.76Å, Si IV 1402.77Å, Si II 1533.43Å, C IV 1548.19Å, C IV 1550.77Å)의 윤곽을 분석하여 다음과 같은 결과를 얻었다.

(1) 전이영역에서 관측된 하강 속도는 7.8km/sec(7×10^4K)에서 10.1km/sec(1.4×10^5K)로 높이(온도증가)에 따라 증가하였으며, 셀(cell)에 비해 네트워크(network)에서 하강 속도가 체계적으로 크게 나타났다. 그리고 하강 속도값은 태양의 가장자리로 갈수록 감소하지만 완전히 사라지지 않았다.

(2)관측된 비열적 속도는 9km/sec(10^4K)에서 35km/sec(5.8×10^5K)로 높이(온도증가)에 따라 증가하였으며, 태양면 중심과 가장자리 사이의 속도 차이는 거의 없었다.

(3)높이(온도증가)에 따른 방출선의 복사강도, 하강 속도, 비열적 속도의 상관관계를 구해본 결과, 복사강도의 경우에는 높이에 다른 상관관계가 뚜렷하게 나타났으나 하강 속도와 비열적 속도의 경우에는 상관관계가 그다지 뚜렷하지 않았다. 관측자료가 제시하는 이와같은 특징과 그 원인에 대해 논의하고자 한다.

THE SOLAR TRANSITION REGION SEEN BY S VI 933 AND H I 931

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We have analyzed a raster scan of high resolution spectra of S VI 933(T=2×10^5K) and H I 931(T=10^4K) lines obtained by SUMER onboard SOHO spacecraft. These lines were taken with spatial resolution of 1.2" across the slit and spectral resolution of 0.044 Å/pixel. The data cover a quiet region of 100" x 100" near disk center. Line parameters such as integrated line intensity, line shift and line width have been determined from a single Gaussian fit to individual line profiles. Some of the important findings are as follows:

(1) The line intensity between these two lines is strongly correlated(correlation coefficient = 0.85), but the Doppler velocity is not as strongly correlated as the line intensity(correlation coefficient = 0.25).

(2) The velocity structure rapidly changes with time within a time scale shorter than that

of the integration time of 110 seconds, while the intensity structure remains nearly unchanged during the same time interval.

(3) The correlation length of the intensity is found to be 5.7"(4100 km), at least 3 times larger than that of the velocity structure. This supports a notion that the basic unit of the transition region is a loop-like structure with a size of a few $10^3 km$, within which a number of unresolved, smaller structures are present.

SIMULATION STUDIES OF SOLAR PROMINENCE FORMATION

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Numerical simulations are performed to investigate the dynamic and thermodynamic response of the coronal plasma to photospheric collective motions in relation to solar prominence formation. First, a purely shearing footpoint motion is considered in a rather low-lying magnetic arcade. The expansion of the magnetic field induces adiabatic cooling of plasma, which leads to a thermal instability. The condensed material presses down the field line and creates a dip, which is the signature of Kippenhahn-Schlüter type prominences.

Second, a converging footpoint motion is applied to a single magnetic arcade combined with a shearing motion . In the lower part of the arcade, a current layer is formed and magnetic reconnection takes place. The enhanced density in the magnetic island induces a thermal instability and the condensed material accumulates at the bottom of the island. The prominence thus formed is a typical Kuperus-Raadu type.

Third, a shearing motion is applied around the polarity inversion line between two bipolar regions. The expansion of the two arcades creates a current layer in which magnetic reconnection can occur. The change intemperature and density above the X-line induces a thermal instability. The prominence in this case sits on field line dips like a Kippenhahn-Schlüter type, but will observationally be identified as an inverse polarity type.