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<研究論文>

경희대학교 천문대의 SL-9의 목성 충돌 후 충돌 자국 진화 연구

손동훈, 송유미, 이서구, 진 호, 김갑성, 김상준
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경희대학교 천문대의 30 inch 망원경과 CCD를 이용하여 1994년 7월 17일 부터 9월 3일까지 혜성 슈메이커-레비 9 (SL-9)의 목성 충돌 흔적을 R Filter를 사용하여 관측하였다. 우리는 충돌 후 충돌 자국 구조의 진화 과정을 한 달 남짓 관측하였다. 20 여 개의 충돌 자국이 분산됨으로 인해 충돌자국끼리 서로 합쳐지거나, 희미한 충돌자국은 더 이상 보이지 않게 되는 것을 관측할 수 있었다. 우리는 충돌자국을 각각 구분하기 위해 가장 최근의 각 혜성 자국의 충돌 시간표를 사용하였다. 그 결과 각각의 충돌 자국들의 각기 다른 분산 현상을 정확히 기록할 수 있었다. Conrath et al. (1990) 의 대기 모델에 의하면 목성의 성층권 바람 속도는 대류권 바람 속도의 1/10 이상으로 느리다. 우리는 각 충돌 자국의 분산 속도를 위의 이론적 성층권 바람 속도, 대류권 바람 속도와 상세히 비교할 것이다.

Similarity and Wilson Depression in Sunspot

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The validity of sunspot models based on the similarity law suggested by Schluter and Temesvary (1958) and later employed by Yun(1968) has been examined by taking into account the effect of the Wilson depression. The magnetostatic sunspots are in horizontal force balance, which causes the Wilson depression (ranging from 400km to 800km), the geometrical difference between the surrounding quiet region and the sunspot. All of the earlier comparisons of the computed models with observations have been made without any consideration of the effect of the Wilson depression. Assuming the radial dependence of the Wilson depression suggested by Solanki et al(1993) and the vertical field gradient obtained by Balthahasar and Schmidt(1993) from observations, a set of magnetostatic sunspot models has been computed with a new shape function and their physical parameters have been obtained. The result shows that the new shape function $\exp(-\alpha^{1.5})$ is found to be more desirable than the earlier $\exp(-\alpha^2)$ since it not only describes better the observed characteristics of sunspot but also removes the local maximum of the total magnetic field strength, for which previous

models were not able to do so. The present study suggests that the similarity of the field distribution depression is taken into account.

HIGH-RESOLUTION SPECTROSCOPY OF THE A-X AND B-X SYSTEMS OF CH IN COMETS

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We analyzed the A-X(0-0) band of CH, which appears in high-resolution spectra of comets Austin(1990 V)and Wilson(1987 VI),in order to understand fluorescence and collisional processes that influence the rotational structure of the A-X(0-0)band. Some of the weak lines of the A-X(0-0) band are clearly resolved, which have not been previously resolved with relatively low-resolution spectroscopy. We unambiguously confirmed the B-X(0-0)band lines around 3890 Å in a comet Austin spectrum. The B-X(0-0)band lines in cometary spectra had been suspected previously and they had not been clearly identified because of strong adjacent CN and C_3 bands. In order to analyze the cometary spectra we have conducted two different fluorescence calculations a single-cycle fluorescence and fluorescent equilibrium. The fluorescent equilibrium model includes infrared and ultraviolet fluorescence processes as well as electron and neutral collisional effects, and therefore the model is a function of cometocentic distance. We found that single-cycle fluorescence models with a Boltzmann distribution in the X state fit the observed spectra better than the fluorescenct equilibrium models. However, single-cycle fluorescence models with two different temperatures(ex.150K for F2 state and 300K for F1 state)in the X state fit the Austin and Wilson spectra much better than the single-cycle fluorescence model with the same temperature(ex. 150K)for F1 and F2 states. This suggests that we are observing two different Boltzmann distributions of nascent, short-life CH radicals right after they were produced by photodissociations of parent molecules. We derived X state rotational temperatures of 150 +/- 20 K for F2 states and 300 +/- 20 K for F1 states of the A-X and B-X bands observed in the comet Austin spectra, and the same temperatures for the A-X band in the comet Wilson spectrum. In the spatially resolved spectra of comet Qustin, we found negligible Greenstein effects. We also compared the single-cycle fluorescence models with moderate resolution spectra of comets P/Halley and Ikeya (1963 I), and found that single-cycle fluorescence models again fits the observations better than fluorescent equilibrium models. We however found that a model with a single temperature(150 K) for the F1 and F2 states fits the Halley spectrum almost perfectly. This suggests that the X state of the CH radicals in Halley accomplished a Boltzmann distribution because of high collision rates in the caused by high as production rate of Halley. For comet Ikeya we found 200K and 350K for the F2 and F1 states. The high temperatures might be caused by small(0.72 AU)heliocentric distance and/or relatively high gas production rate of comet Ikeya at the time of the observation. We also discuss possible parent molecules of CH and long lifetimes of the parent molecules, which may explain extensive emissions of CH up to 10^5km from the nucleus dec\spite its short lifetime.