

- 2) Bar의 구조적 특징은 disk보다 Spheroid의 특성과 더 깊은 관련성이 있다.
- 3) Hubble type에 따른 bar의 Scale brightness나 Scale length의 분포의 특징은 이들량과  $R_e$ 와의 관련성에 의해 해석될 수 있다.
- 4) 막대운하의  $(r, l)$  type이나 나선팔의 형태는 막대의 특성과 깊은 관련성이 있다.
- 5) 이상에서와 같이 막대운하의 내부구조를 지배하는 가장 중요한 parameter는 spheroid의 luminosity concentration을 나타내는  $R_e$ 로 볼 수 있다.

### **Stellar Populations in External Galaxies. III. Super Metal Rich Giants**

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Stellar populations in three external galactic nuclei, M31, M32, and M33 are estimated using "population synthesis" method based on linear programming algorithm. The contribution of Super Metal Rich (SMR) giants to the integrated light of those galaxies is investigated. In contrast to the tight astrophysical constraints adopted by previous workers, loose constraint set is established from various stellar evolution theories.

When compared to the conventional old metal-rich (OMR) population models obtained with tight constraints, our models show lower SMR content. With the result that predicted UV flux distribution is brighter than the observation (Paper II), minor contribution from SMR giants implies that, in population synthesis technique the loose constraints might avoid the UV deficiency problem and abnormal abundance distribution on the H-R diagram arisen in OMR models.

Since the population models are very sensitive to the astrophysical constraints and the stellar content in external galactic nuclei may be quite different from the solar neighborhood from which the tight constraints are derived, we conclude that the population models obtained by the loose astrophysical constraints are more reasonable.

### **A Study of the Solar Motion and Velocity Dispersions with Gliese Nearby Star Catalogue**

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Utilizing the data in the nearby star catalogue of Gliese(1969; 1979), we obtained the Solar motion and velocity dispersions from three independent methods. The radial velocity, proper motion, and space motion data are used for corresponding methods, respectively. The trend of the resulted solar motions for spectral types shows similar properties to the previous investigations. However, different methods of analysis yield inconsistent results for the same data. Therefore, it seems that the conventionally accepted solar motion should be reconsidered with more precisely determined recent data.

### **A Two Cavity Model for Umbral Oscillations**

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In the present study a two-mode, separately concurring resonant cavity model is proposed for

theoretical interpretation of the 3 minute umbral oscillations. The proposed model has been investigated by calculating the transmission coefficients of the waves propagating through the umbral photosphere (photospheric weak-field cavity) and chromosphere (chromospheric strong-field cavity) into the corona, for 3 different umbral model atmosphere by Staude model (1982), Yun and Beebe model (1986) and Avrett model (1981).

The computed resonant periods, transmission spectra, phase spectra and kinetic energy density of the waves associated with the oscillations are presented in comparison with the observations and their model dependent characteristics are discussed.

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### < 研究論文 >

## Evolution of the Central Black Hole in an Active Galactic Nucleus

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We analyze the long term evolution of the central black hole in a 'semi-time-dependent' model of an active galactic nucleus, where the mass of the central black hole is being extracted by the Blandford-Znajek process. Assuming the accretion rate to be a constant leads to a conflict with observation. Consequently we suggest that the evolution of active galactic nuclei must be driven by a rapid decrease of the accretion rate, and that the evolution proceeds from QSOs to nuclei of Seyfert galaxies or radio galaxies. We also estimate the probable accretion rate evolution, and therefore, the probable evolution of the power output extracted from the magnetosphere of the central black hole by the Blandford-Znajek process, the total mass of the hole, and the magnetic field strength.

## Radial Colour Gradient in 47 Tuc

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To find the reality of the radial colour gradient in 47 Tuc, we analyze the recent CCD data published by Hesser et al. (1987 preprint). Their F3/F4 data used for this work were in the range of  $1' \sim 7'$  and contain stars brighter than  $V=20$  mag. From these data we want to reproduce the radial integrated colour.

The result confirms the existence of an obvious radial change of the calculated B-V colour indices. This color gradient seems to come from the concentration of giant stars.