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DATA CENTRE FOR ASTROPHYSICS

UNIVERSITÉ DE GENÈVE
FACULTÉ DES SCIENCES
Département d'astronomie

ASTROPHYSICS SEMINAR

Wednesday, 23 September 2009 at 11:00

Precision photometric monitoring of young low-mass stars and brown dwarfs:
shedding light on rotation, pulsation, and the star-disk connection

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Abstract. Young star-forming regions are host to a variety of optically variable sources, from accreting and flaring stars to those whose light is modulated by surface spots. In addition, recent theory has suggested that a new type of variability – pulsation powered by deuterium burning – may be at work on hour timescales in young brown dwarfs and very low mass stars. Photometric studies of these diverse phenomena are key in probing the underlying physics governing the evolution of few-Myr-old cluster members. High-cadence time series provide insight into not only the stochastic nature of accretion, but also trends in rotation via monitoring of magnetic surface spots. Nevertheless, a complete characterization of variability down to low amplitudes, and particularly amongst very-low-mass (0.01-0.3 $M_{\odot}$) objects, remains elusive. The lower limit to rotation periods in young clusters is not well established, and mechanisms regulating angular momentum down through the substellar regime are not well understood. To expand the census of variability to very low mass and short timescales, as well as assess the possibility of deuterium-burning pulsation, we have carried out a dedicated monitoring campaign on confirmed low-mass members in several 2-5 Myr clusters. Using meter-class telescopes, our survey achieves sensitivity to periodic variations with photometric amplitudes down to the millimagnitude level on timescales ranging from a fraction of an hour to several weeks. We present results from the 5 Myr Sigma Orionis cluster, including a new compilation of rotation rates and a strong correspondence between variability type and presence of a disk, as indicated by Spitzer/IRAC excesses. In contrast to previous reports of 1-4-hour variability amongst brown dwarfs, we find a dearth of periods under 10 hours. However, we identify a significant positive correlation between rotation period and mass.

Additional Information

The seminars are given in the ISDC "Pavillon" building
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