

N11a **Observational discoveries in roAp stars with high precision VLT radial velocity and line profile studies**

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We have obtained a large amount of data on dozens of rapidly oscillating Ap stars with the Ultraviolet and Visual Echelle Spectrograph (UVES) on the 8.2-m VLT with time resolution typically around 1 minute and radial velocity precision as high as 1 m s^{-1} . Abundance stratification caused by atomic diffusion in the presence of strong global magnetic fields gives promise of three-dimensional maps of the pulsation amplitude and phase and the abundance distributions of many ions that may provide the strongest observational tests of atomic diffusion theory. Studies of individual spectral lines and of line profile variability sample the observable atmospheres of roAp stars from continuum optical depth $\tau_{5000} \sim 1$ to as high as $\tau_{5000} \sim 10^{-5}$, revealing fascinating new pulsational behaviour not observed in other types of pulsating stars, including line profile variability in rare earth elements lines interpreted by Shibahashi, Gough, Kurtz, Kambe (2008, PASJ, in press) as evidence for shock waves in the high atmosphere of these stars.