

# OBSERVATIONS OF MAGNETO-ACOUSTIC PULSATIONS IN PECULIAR A STARS

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Strong global magnetic fields up to 10s of kG are observed in the Ap SrCrEu stars, arguably the most peculiar stars known, with overabundances of rare earth elements up to  $10^5$  greater than that seen in normal stars. The abundance anomalies arise from atomic diffusion guided by the magnetic field so that there are significant horizontal abundance variations, and vertical stratification can be extreme. Spectral lines of some rare earth elements form at continuum optical depths  $\log \tau_{5000} \sim -5$ , while the Balmer lines form in the range  $-4 \leq \log \tau_{5000} \leq -2$  and the Fe-peak elements form at “normal” depths of  $\log \tau_{5000} \sim -0.5$ . Thus we can resolve the depth structure of the atmospheres of these peculiar stars in greater detail than for any stars other than the sun, and we can directly observe levels that are the equivalent of chromospheric atmospheric height in the sun. The roAp stars pulsate with periods between 5.65 and 21.2 min. The modes are magneto-acoustic at some levels, and give rise to decoupled magnetic and acoustic oscillations at higher levels. High resolution VLT spectroscopic observations will be presented that give remarkable new insight into the interactions of pulsation, rotation and turbulence in the presence of magnetic fields far stronger than those observed in sunspots. Rich asteroseismic frequency sets from photometry with the ground-based Whole Earth Telescope network and the WIRE satellite will also be presented.