# Pollux: a stable weak dipolar magnetic field but no planet ?

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**Abstract**

Pollux is considered as an archetype of a giant star hosting a planet (Its Radial Velocity (RV) presents periodic sinusoidal variations, period about 590 d, which have been stable for more than 25 years). Using ESPaDOnS and Narval we have detected a weak (sub-gauss) magnetic field at the surface of Pollux and followed up its variations during 4.25 years, i.e. more than for two periods of the RV variations. The longitudinal magnetic field is found to vary with a sinusoidal behaviour of a period close to that of the RV and with a small shift in phase. We then made a Zeeman Doppler Imaging investigation from the Stokes V and Stokes I LSD (least squares deconvolution) profiles . A rotational period is determined, which is consistent with the period of variations of RV. The magnetic topology is found mainly poloidal: the poloidal component dominates the magnetic energy and is almost purely dipolar. The mean strength of the surface magnetic field is about 0.7 G. Our result shows that to explain the RV variations, an hosted planet around Pollux should be synchronized with the rotation of the star and interact with its surface, which appears unlikely because of the large distance between the two bodies involved by the long period. As an alternative, we suggest that the magnetic dipole can be associated with two temperature and macroturbulent velocity spots which could be sufficient to produce the amplitude of the RV variations. The stability of the weak magnetic field topology along two rotations and maybe tens of years, could be explained by a turbulent dynamo or by the interplay of a fossil field burried in the radiative zone with the convective envelope.

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