On the co-existence of chemically peculiar Bp stars, slowly pulsating B stars and constant B stars in the same part of the H-R diagram

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Aims. In order to better model massive B-type stars, we need to understand the physical processes taking place in slowly pulsating B (SPB) stars, chemically peculiar Bp stars, and non-pulsating normal B stars co-existing in the same part of the H-R diagram.
Methods. We carry out a comparative study between samples of confirmed and well-studied SPB stars and a sample of well-studied Bp stars with known periods and magnetic field strengths. We determine their evolutionary state using accurate HIPPARCOS parallaxes and Geneva photometry. We discuss the occurrence and strengths of magnetic fields as well as the occurrence of stellar pulsation among both groups. Further, we make a comparison of Geneva photometric variability for both kinds of stars.
Results. The group of Bp stars is significantly younger than the group of SPB stars. Longitudinal magnetic fields in SPB stars are weaker than those of Bp stars, suggesting that the magnetic field strength is an important factor for B type stars to become chemically peculiar. The strongest magnetic fields appear in young Bp stars, indicating a magnetic field decay in stars at advanced ages. Rotation periods of Bp and pulsation periods of SPB stars are of the same order and the behaviour of Geneva photometric variability of some Bp stars cannot be distinguished from the variability of SPB stars, illustrating the difficulty to interpret the observed variability of the order of days for B-type stars. We consider the possibility that pulsation could be responsible for the variability among chemically peculiar stars. In particular, we show that a non-linear pulsation model is not excluded by photometry for the Bp star HD175362.

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