New magnetic field measurements of beta Cephei stars and Slowly Pulsating B stars

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We present the results of the continuation of our magnetic survey with FORS1 at the VLT of a sample of B-type stars consisting of confirmed or candidate beta Cephei stars and Slowly Pulsating B (hereafter SPB) stars, along with a small number of normal B-type stars. A weak mean longitudinal magnetic field of the order of a few hundred Gauss was detected in three beta Cephei stars and two stars suspected to be beta Cephei stars, in five SPB stars and eight stars suspected to be SPB stars. Additionally, a longitudinal magnetic field at a level larger than 3sigma has been diagnosed in two normal B-type stars, the nitrogen-rich early B-type star HD52089 and in the B5 IV star HD153716. Roughly one third of beta Cephei stars have detected magnetic fields: Out of 13 beta Cephei stars studied to date with FORS1, four stars possess weak magnetic fields, and out of the sample of six suspected beta Cephei stars two show a weak magnetic field. The fraction of magnetic SPBs and candidate SPBs is found to be higher: roughly half of the 34 SPB stars have been found to be magnetic and among the 16 candidate SPBs eight stars possess magnetic fields. In an attempt to understand why only a fraction of pulsating stars exhibit magnetic fields, we studied the position of magnetic and non-magnetic pulsating stars in the H-R diagram. We find that their domains in the H-R diagram largely overlap, and no clear picture emerges as to the possible evolution of the magnetic field across the main sequence. It is possible that stronger fields tend to be found in stars with lower pulsating frequencies and smaller pulsating amplitudes. A somewhat similar trend is found if we consider a correlation between the field strength and the vsini-values, i.e. stronger magnetic fields tend to be found in more slowly rotating stars.

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Comments:

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