Astronomische Nachrichten 2017 vol.338 N8, pages 910-918

# Statistics of magnetic field measurements in OBA stars and the evolution of their magnetic fields

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## Abstract

© 2017 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim We review the measurements of magnetic fields of OBA stars. Based on these data, we confirm that magnetic fields are distributed according to a lognormal law with mean log B = − 0.5 (B in kG) with a standard deviation σ = 0.5. The shape of the magnetic field distribution (MFD) is similar to that for neutron stars. This finding favors the hypothesis that the magnetic field of a neutron star is determined mainly by the magnetic field of its predecessor, namely the massive OB star. Further, we model the evolution of an ensemble of magnetic massive stars in the Galaxy. We use our own population synthesis code to obtain the distribution of stellar radii, ages, masses, temperatures, effective magnetic fields, and magnetic fluxes from the pre-main-sequence (PMS) via zero-age main sequence (ZAMS) up to the terminal-age main sequence stages. A comparison of the MFD obtained in our model with that obtained from the recent measurements of the stellar magnetic field allows us to conclude that the evolution of magnetic fields of massive stars is slow if not absent. The shape of the real MFD shows no indications of the magnetic desert proposed previously. Based on this finding, we argue that the observed fraction of magnetic stars is determined by physical conditions at the PMS stage of stellar evolution.

http://dx.doi.org/10.1002/asna.201713405

## Keywords

stars: early type, stars: magnetic fields, stars: statistics

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