Observation and modelling of main-sequence star chromospheres – XVIII. Observations of the Ca ii resonance lines and Hα line for dM4 stars and dK5 stars

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Résumé en anglais	We use 665 high-resolution spectra for 60 different dM4 stars and 1088 high-resolution spectra for 97 different dK5 stars from the European Southern Observatory (ESO) and Observatoire de Haute Provence (OHP) data bases. We present 179 new measurements of the Ca ii resonance lines and 615 new measurements of the Hα line for dM4 stars. We also present 701 new measurements of the Ca ii resonance lines and 1088 new measurements of the Hα line for dK5 stars. We also compiled other measurements available in the literature.We cross-correlate the activity diagnostics, namely the Ca ii resonance line characteristics, the Hα line characteristics and LX. We set new constraints on some empirical relationships between these parameters that are important for constraining the chromospheric modelling of these stars. We study the Ca ii line mean equivalent width (EW) as a function of absolute magnitude (Mv) for three spectral types: dK5, dM1 and dM4. We show that the magnetic activity level is rather constant with Mv for both dM4 and dK5 stars in contrast to dM1 stars for which the magnetic activity level increases with diminishing Mv. In other words, only dM1 stars show this particular dependence of the level of magnetic activity with Mv. From the correlations of the magnetic activity indices with P/sin i, we find that the Ca ii EW and LX grow increasingly faster as the spectral type increases from dK5, dM1 to dM4. The exponents in the Ca ii–P/sin i correlations are −0.80, −1.53 and −3.72 for dK5 stars, dM1 stars and dM4 stars, respectively. We also find that the X-ray luminosity grows faster than the chromospheric Ca ii emission when the rotation rate increases. Moreover, we found that the exponent on P/sin i for both the Ca ii and LX correlations is about twice smaller for dK5 stars than for dM1 stars. Therefore, the level of magnetic activity in dK5 and dM4 stars is more dependent on rotation than on the stellar radius, the opposite result to that found for dM1 stars.
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