DIAGNOSTIC USE OF FE II H & K WING EMISSION LINES

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The Fe II λ3969.4 line is one of the weak lines in the wings of Ca II H and K that appear in emission near the solar limb, and in the flux spectra of cool giants. In spatially resolved solar spectrograms the line shows very pronounced small-scale spatial intensity variation, which is strongly correlated to the line structure of the local H-wing background, and not at all to the chromospheric structure seen in the H & K cores. A 15-level atomic model computation for iron shows that this behaviour is due to pumping by photons in the wings of the strong Fe II resonance lines near 2600 Å, in the deep photosphere. The λ3969.4 line is therefore deeply controlled, with large sensitivity to photospheric inhomogeneities, while its background is formed much higher. This makes the line a useful diagnostic of stellar photospheric line structure, in contrast to the adjacent H core for which emission indicates chromospheric line structure.

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