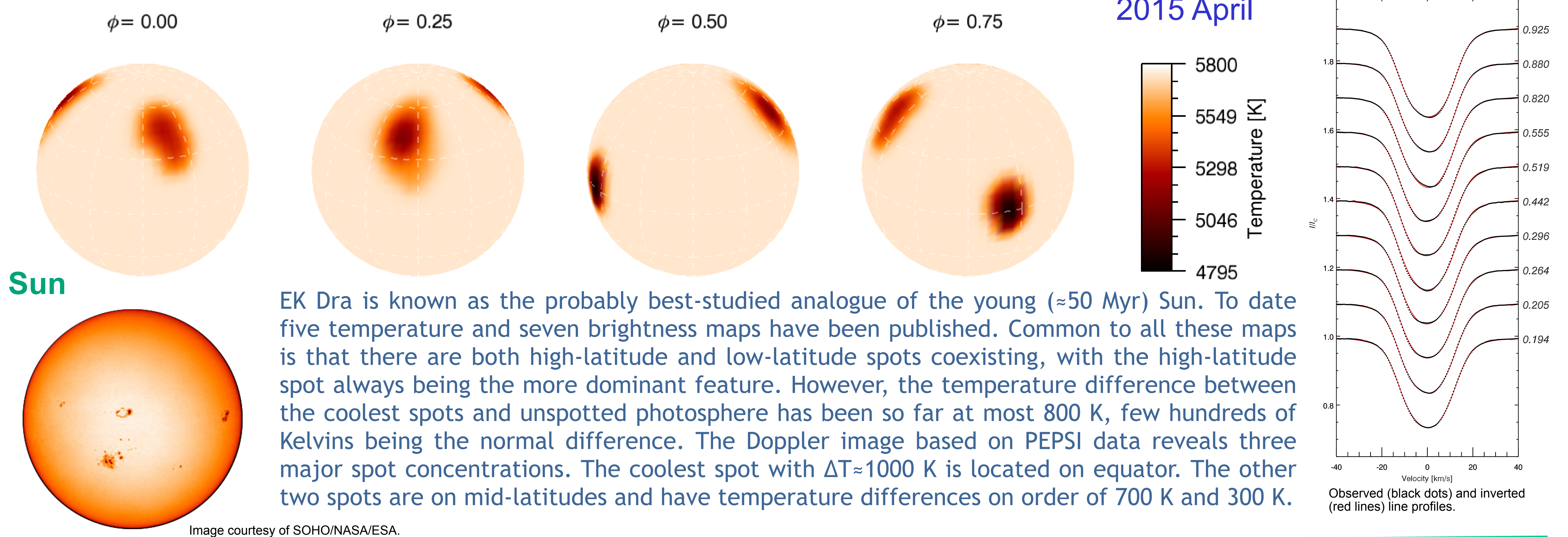


First Doppler images with PEPSI

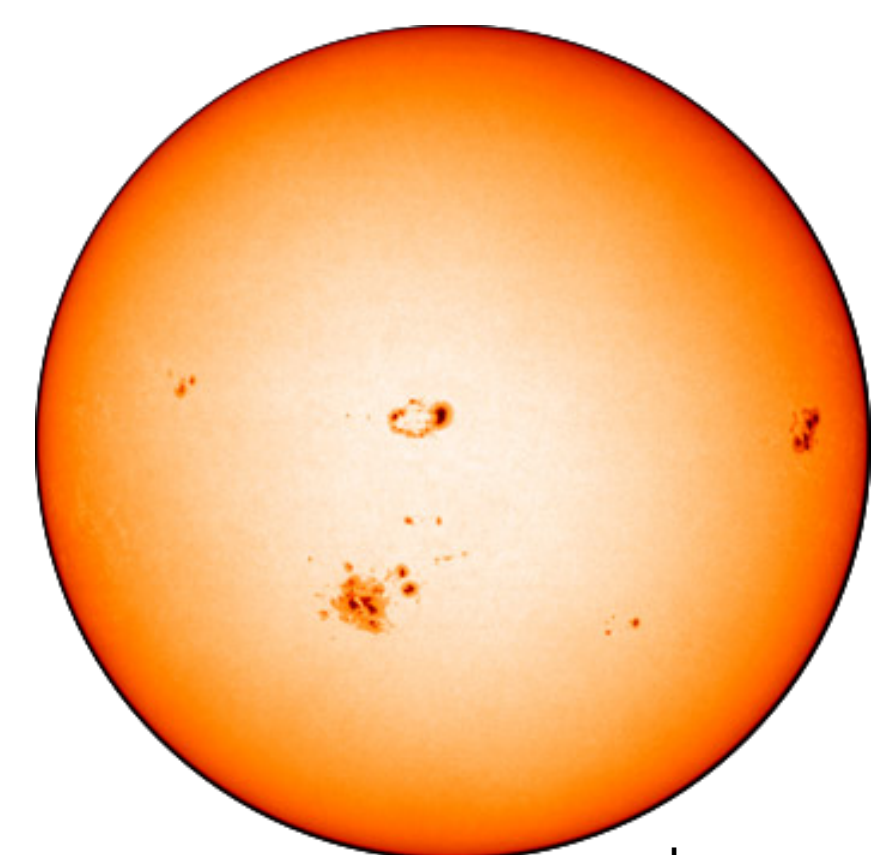
S. P. Järvinen, T. A. Carroll, D. P. Sablowski, K. G. Strassmeier, & I. Ilyin (AIP)

We present the first Doppler images based on ultra-high resolution ($R=250,000$) spectra obtained with the Potsdam Echelle Polarimetric and Spectroscopic Instrument (PEPSI) at the Large Binocular Telescope (LBT) and the Vatican Advanced Technology Telescope (VATT). The selected targets are the young solar twin EK Dra, the hot-Jupiter host τ Boo, and the close double-lined active binary HR 5110. All these targets have rather small projected rotational velocities and the earlier attempts to map them have been limited by the surface resolution via the Doppler effect. With PEPSI we can have 25-30 resolution elements across the stellar disk and are able to detect more subtle temperature variations than ever before.

EK Dra



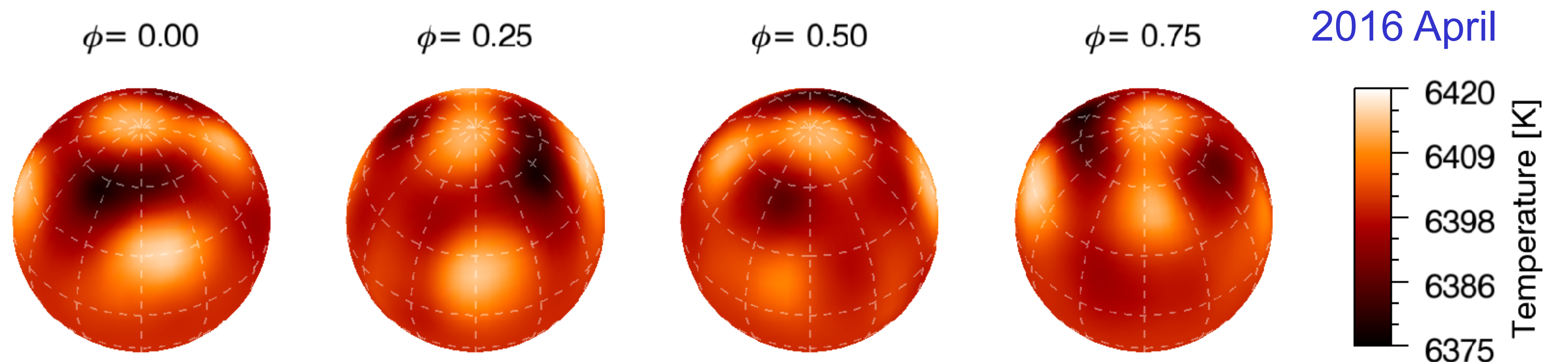
Sun



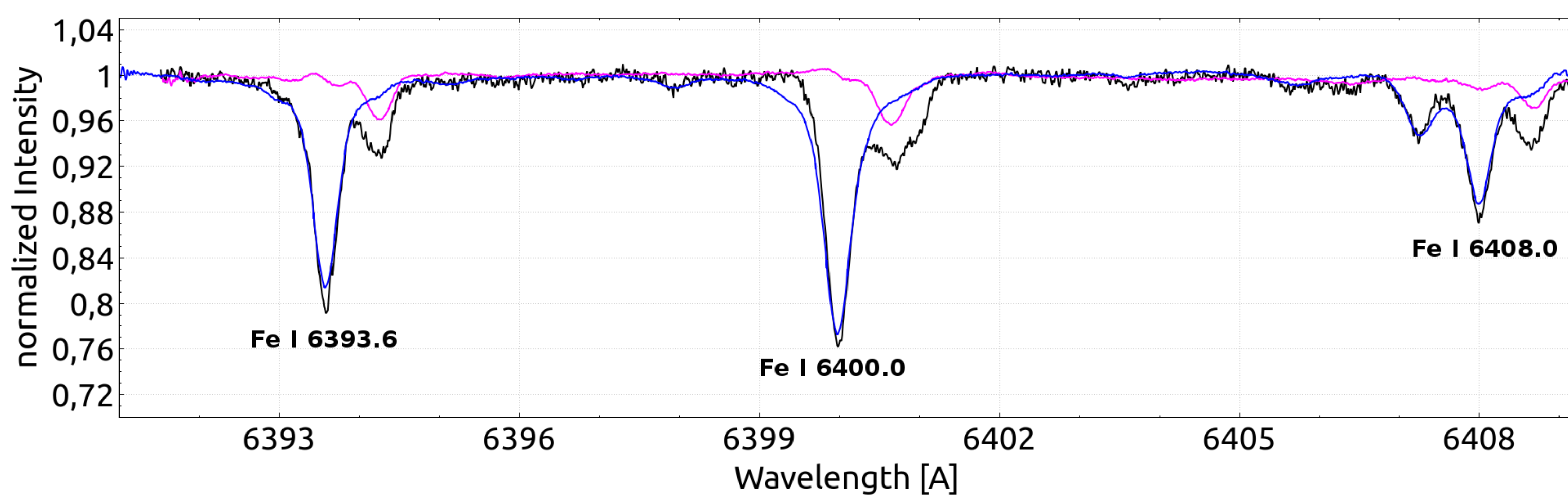
EK Dra is known as the probably best-studied analogue of the young (≈ 50 Myr) Sun. To date five temperature and seven brightness maps have been published. Common to all these maps is that there are both high-latitude and low-latitude spots coexisting, with the high-latitude spot always being the more dominant feature. However, the temperature difference between the coolest spots and unspotted photosphere has been so far at most 800 K, few hundreds of Kelvins being the normal difference. The Doppler image based on PEPSI data reveals three major spot concentrations. The coolest spot with $\Delta T \approx 1000$ K is located on equator. The other two spots are on mid-latitudes and have temperature differences on order of 700 K and 300 K.

τ Boo

Although there exists Zeeman-Doppler images of the hot-Jupiter host τ Boo, there are no previous temperature nor brightness maps of it. The first attempts to map temperature variations of the surface of τ Boo resulted in a homogeneous temperature distribution. Only after the effect of the planet was removed, the surface temperature structure of τ Boo was revealed.



HR 5110



The active double lined binary HR 5110 consists of F2 IV and K2 IV components. Before we are able to perform Doppler imaging, the spectra have to be disentangled. This is done using Spectacular software (Sablowski & Weber 2017, A&A, 597, A125).

An example of PEPSI spectrum of HR 5110 (black line). The disentangled spectrum of the primary component is plotted with blue and of the secondary with purple.