

AIP – Astrophysikalisches Institut Potsdam

**PRESS RELEASE 02/10**

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**Solar-like oscillations discovered on a magnetically active spotted star**

Using the HARPS spectrograph on ESO's 3.6m telescope at La Silla in Chile, a small team of international astronomers from ESO, the University of Sydney and AIP detected for the first time solar-like oscillations in radial velocity on a late-type spotted star. The star is located in the constellation Eridanus and is called "EK Eridani". Although the data did not allow resolving individual frequencies as has been done for the Sun, an amplitude per radial oscillation mode of just 15 centimetres per second (cm/s) with oscillation periods of about 50 minutes was measured. Surprisingly, this amplitude is at least a factor of 3 lower than expected from an extrapolated solar model and, if confirmed, may mean that the star's magnetic field has a strongly stabilizing effect on the stellar geometry, essentially favouring high order oscillation modes in the presence of a near-dipole magnetic field. This may have profound implications for our future understanding of stellar structure and magnetic activity and possibly even for stellar evolution of late-type stars.

Parallel observations were made with the robotic photoelectric telescope "Amadeus" in Arizona. They have been ongoing for 30 years and a new determination of the star's light variations reveals a period of 309 days. This is already the longest known photometric period of any spotted star. However, the dipole structure of the stellar surface activity suggests that this period must be doubled to give the true surface rotation period, i.e. approximately 618 days. Note that the Sun rotates once around its axis in just 27 days and mostly oscillates with a period of around 5 minutes. Also note that the currently best measures can resolve a velocity amplitude on the Sun of 1 mm/s. Although our target star rotates more than 20 times slower than the Sun, it is magnetically much more active. "Astronomers have been puzzled by this for a decade and our new detection of radial oscillations may provide new insights into the dynamo mechanism that generates the magnetic field", says Prof. Strassmeier, director of the Cosmic Magnetic Field branch at AIP in Potsdam, Germany.

Stellar astronomers are nowadays used to observe other stars with dark spots on their surfaces just as we know it from our Sun. These "starspots" are - like sunspots - concentrated magnetic fields that suppress the upwards convective energy flow with respect to their surroundings. The spots are therefore cooler and appear to be dark when they are observed. Yet other stellar astronomers are nowadays used to observe stars that are oscillating like a bell with many different oscillation modes and frequencies. These stars are usually more massive than the Sun and their oscillations are excited by violent convection in the outer parts of the star. Spots and oscillations have been studied for decades in the Sun, where both phenomena are acting together, spots due to magnetic fields and oscillations due to convection.

**Further information:**

Dall, T. H., Bruntt, H., Stello, D., Strassmeier, K. G. "Solar-like oscillations and magnetic activity of the slow rotator EK Eri", *Astronomy & Astrophysics*, in Druck

**Imagery:**

Image 1: The radial velocity variations of the active G8 subgiant EK Eridani due to stellar oscillations. Three consecutive nights of high cadence monitoring with the HARPS spectrograph at the 3.6m ESO telescope at La Silla reveals a maximum oscillation power of 320 $\mu$ Hz (approximately 50 minutes) with an amplitude per radial mode of 15 centimetres per second. Image: Thomas H. Dall/ESO

Image 2: Thirty years of Johnson-V band photometry of EK Eridani (top panel) together with 12 years of simultaneous V-I colour photometry (lower panel) indicate a photometric period of 309 days from a Discrete Fourier Transform (DFT) analysis. The vertical dashes indicate the 309-day period. Such data are made possible by the incorporation of small, dedicated robotic telescopes. Image: Klaus G. Strassmeier/AIP

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*ESO, the European Southern Observatory, is the foremost intergovernmental astronomy organisation in Europe and the world's most productive astronomical observatory. It is supported by 14 countries: Austria, Belgium, the Czech Republic, Denmark, France, Finland, Germany, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom.*

*The Astrophysical Institute Potsdam (AIP) is a research organization of the Leibniz-Association and is located in Potsdam/Babelsberg at the south-western border to Berlin. About 140 personnel work on a variety of astrophysical and astro-engineering topics. The AIP is partner of the Large Binocular Telescope in southern Arizona.*

*The Sydney Institute for Astronomy (SifA) pursues theoretical and observational research across a wide range of astrophysics. From the centre of the Sun to the edge of the Universe, this program utilizes the latest technologies and techniques. These include the School's own radio telescope, the Molonglo Observatory Synthesis Telescope, and the Sydney University Stellar Interferometer which is a major element of a broad program of high resolution optical imaging.*

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Das AIP beschäftigt sich vorrangig mit kosmischen Magnetfeldern und extragalaktischer Astrophysik. Daneben wirkt das Institut als Kompetenzzentrum bei der Entwicklung von Forschungstechnologie in den Bereichen Spektroskopie, robotische Teleskope und E-Science. Das AIP ist Nachfolger der 1700 gegründeten Berliner Sternwarte und des 1874 gegründeten Astrophysikalischen Observatoriums Potsdam, das sich als erstes Institut weltweit ausdrücklich der Astrophysik widmete. Das AIP ist eine Stiftung privaten Rechts und ein Institut der Leibniz-Gemeinschaft. Zur Leibniz-Gemeinschaft gehören derzeit 86 Forschungsinstitute und Serviceeinrichtungen für die Forschung sowie drei assoziierte Mitglieder, die wissenschaftliche Fragestellungen von gesamtgesellschaftlicher Bedeutung bearbeiten.

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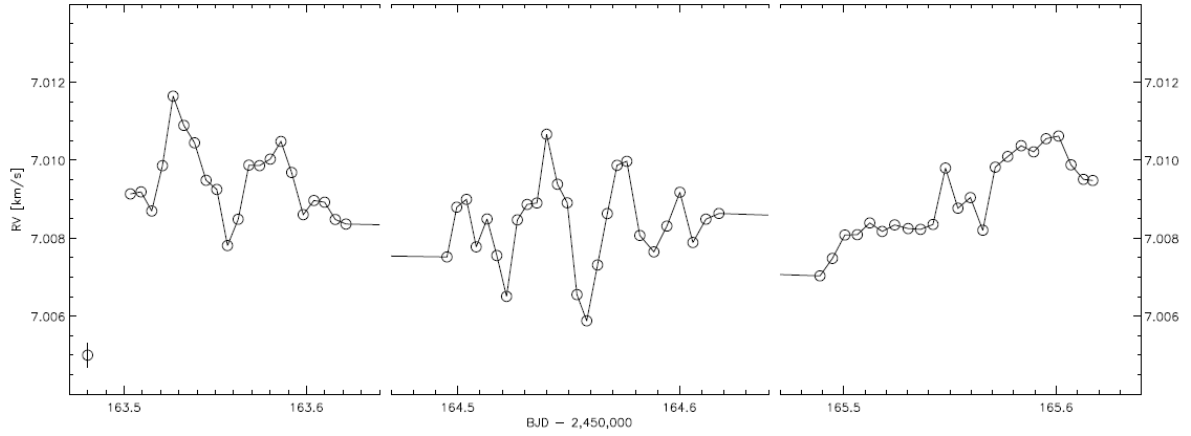


Image 1

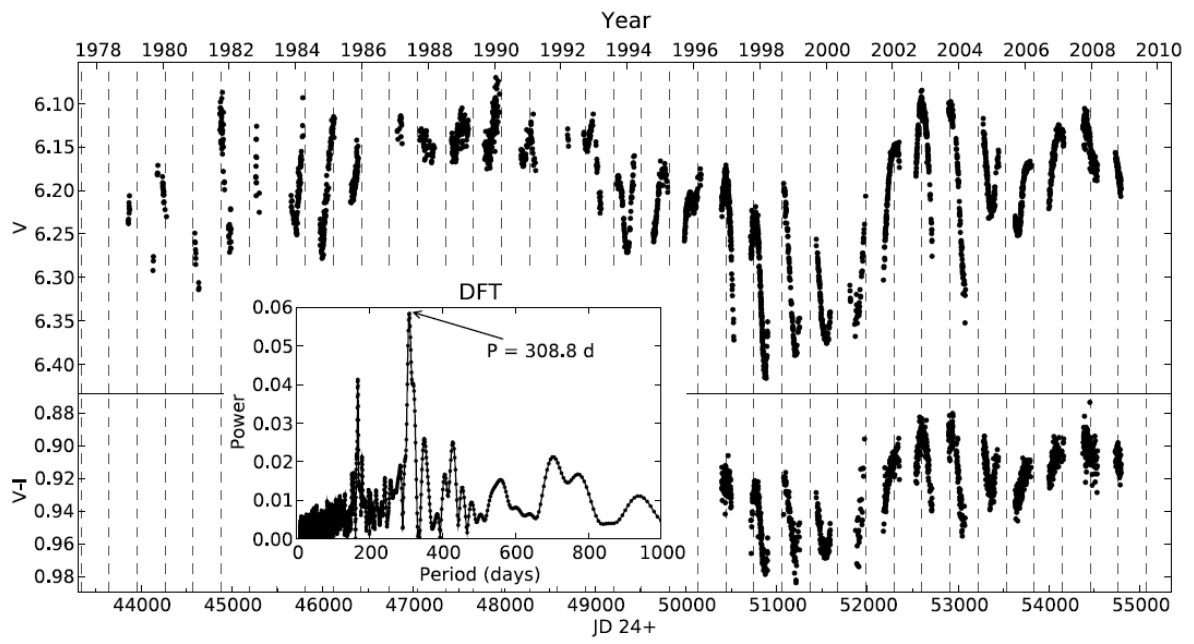


Image 2