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Rotation period, chromospheric activity, lithium abundance, and depth of the outerconvective zone play an important role in the study of the processes at work in thestellar interior and exterior, in particular we have been investigating the link betweenthese parameters and solar twins stars. Our sample consists of 88 solar twin field starswith surface lithium abundance for 76% of them. These objects were selected fromliterature. This sample allows us to investigate whether the surface lithium abundanceof solar twins can be described in terms of the chromospheric activity, rotation periodand convective zone mass deepening. We have also analyzed the link among this parameters and the stellar age in this sample. We derived an extensive grid of stellarevolutionary models, suitable to solar twins stars, for a thin set of mass and metallicity. From these models, the mass depth of the outer convective zone were estimated forthese solar twins, the stellar mass and age have recalculated. Our determination of stellar parameters is in good agreement with the measurements published in the literature.Our theoretical models provide a good description for increasing lithium depletion withrespect to age for solar twins. We also realized that all these parameters are closely related for this sample. These results illustrate that solar twins stars present a closelyand reciprocal relation between A (Li) and the stellar parameters, Age, chromosphericactivity, convective zone mass deepening and rotation period.

STELLAR MAGNETIC CYCLES IN THE SOLAR-TYPE STARS KEPLER-17 AND KEPLER-63

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The stellar magnetic field plays a crucial role in the star internal mechanisms, as well asin the interactions with its environment. Starspots characterization provide informationabout the magnetic field of the star, such as its activity cycle. The objective of thiswork is to characterize the magnetic activity of stars. Here, we studied the magneticactivity of two solar-type stars Kepler-17 and Kepler-63. Two methods were used toestimate their cycle length. The first one characterizes the spots (radius and intensity)by fitting the small variations in the light curve of a star caused by the occultation ofa spot during a planetary transit. This approach yields the number of spots present inthe stellar surface and the flux deficit subtracted from the star by their presence duringeach transit. The second method estimates the activity from the excess in the residualsof the transit lightcurves. This excess is obtained by subtracting a spotless star model transit from the lightcurve, and then integrating all the residuals during the transit. Thepresence of long term periodicity is estimated from the analysis of a Lomb-Scargleperiodogram of all time series. Finally, the results of both methods agree, and weconcluded that the stars present a short magnetic activity cycle of 1.70 yr (Kepler-17)and 1.30 yr (Kepler-63). These cycle periods are consistent with that of active starsfound in the literature.

OPTICAL MODELING OF POLARS: THE CASES OF SWIFT 2319.4+2619 AND RXJ01545947

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Polars are close binary systems, formed by a compact object, a white dwarf (WD) and ared dwarf. Matter is transferred between the stars, being accreted towards the WD surface through the strong magnetic field, forming an accretion column. Our group developed a code that reconstructs the geometry of the accretion column of polars by takinginto account the relevant emission processes involved, specially the cyclotron emission. In this work, we present the modeling of optical multi-band photo-polarimetric light curves of polars. Our data set was observed at the Pico dos Dias (OPD) Observatoryusing an imager polarimeter over the period 2010-2012. We present the data analysisand modeling for 2 systems of our sample: Swift 2319.4+2619 and RXJ0154-5947.Swift2319+2619 shows a photometric modulation of 1.6 mag along the orbital period,from 16.0-17.7 mag, that is consistent with previous V band observations. We alsorefined the orbital period, and found a new value of 0.1675562 d. Circular polarizationvaries from 0-12% in R band, indicating a single pole system. RXJ0154-5947 showscircular polarization up to 15% in V and R band. Circular polarization varies from 0up to 10 and 15% on R and V bands, respectively. The polarization modulation hasa double peak and a interval with zero values, indicating a self-eclipse of the emittin gregion by the WD.

DELAYED THERMALIZATION EFFECTS IN THERMONUCLEAR SUPERNOVAE EXPLOSION

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Numerical models of Type Ia supernovae (SNe Ia) have been extensively applied totest general ideas about possible explosion mechanisms. Regardless of the exact details of the mechanism, these supernovae are driven by thermonuclear runaway from nuclear reactions of carbon and oxygen within a white dwarf, therefore called thermonuclear supernovae. Many simulations of thermonuclear supernova assume instantaneous thermalization of the burning matter within a large domain of fluid elements used. However, we expect the appearance of transient processes such as convection currents, vortices, and other collective motions on smaller scales, which can delay thermodynamics equilibrium in the burning material. To simulate these effects in asimple one-dimensional hydrodynamical calculation, we introduce a time delay in the hydrodynamic equations and show that such effects could have a significant influence on the evolution of the supernova explosion and nucleo synthesis.

NEW INSIGHTS ON GALACTIC ARCHAEOLOGY: AGE--ABUNDANCE CORRELATIONS

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Most previous studies on chemical evolution of the Galaxy are based on abundance ratios as a function of metallicity ([Fe/H]). Direct correlations between abundance ratiosand age are largely unexplored mainly due to the large errors in stellar ages. Using solartwins we can obtain, through a strict differential analysis, both precise chemical abundances (0.01 dex precision) and reliable stellar ages. In this work we use UVES/ESO and HIRES/Keck spectra to determine the stellar parameters and chemical composition of a sample of solar twins, using the Sun as a reference star. We show the distinct behavior of [X/Fe] abundance ratios for different type of elements (iron peak, alpha, s-