

**Marie Skłodowska Curie Action – Postdoctoral Fellowship 2023**  
**Expression of interest – Hosting offer**  
**(MSCA-PF-2023)**

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<b>Department /Institute /Centre</b>	<b>Name</b>	Department of Applied Mathematics. E.T.S. de Ingeniería Agronómica, Alimentaria y de Biosistemas.
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	<b>Province</b>	Madrid
<b>Research Area</b>		Environment and Geoscience (ENV) Mathematics (MAT) Information Science and Engineering (ENG)
<b>Brief description of the Centre/Research Group</b>		<p>The GSC (<b>Complex System Research Group</b>) is a multidisciplinary team of 20 researchers, belonging to different UPM Schools, with extensive research and teaching experience in Physics, Mathematics, Statistics, Chemistry and various branches of Engineering. Their training allows them to carry out high-quality research work, internationally recognized, <b>in the interdisciplinary area of Complex Systems</b>. GSC collaborates with similar groups in the US, South America and Europe. Within the UPM, it occupies the global position 11/184 of the research groups according to the latest Results Report of the UPM Quality Plan of 2019, highlighting position 3/184 in the dissemination of research results and position 5 /184 in the recognition of merits.</p> <p>One of the research lines in the GSC is <b>Biocomplexity in Agrarian Systems</b>. The behaviour of agricultural systems is not linear, because it refers to feedback loops that can explain and predict the behaviour of each element, which, when affected, has an impact on the others, like an interconnected network of information. In our group we have focused on: scale laws that relate different levels of aggregation, predictive models based on machine learning, and patterns recurrence in agricultural systems.</p> <p>We are <b>applying these tools to various topics</b> such as: analysis of porous soil structures, mapping of vegetation indices and soil properties, dynamics of grasslands in semi-arid zones and deforestation.</p> <p><a href="http://www.gsc.upm.es/gsc3/">http://www.gsc.upm.es/gsc3/</a></p>



## Expression of Interest – UPM Supervisor

<b>Project description</b>	<p><b>Ecosystems are considered complex systems with non-linear dynamics</b> in space and time for more than three decades. However, only recent research focuses on tackling the complexity of ecosystem temporal dynamics with various methodologies. As an eco-social system, rangelands comprise 30–40% of the Earth’s landmass, supporting approximately 1 billion people; this makes them suitable land types to study ecosystem dynamics with significant human activity effects. This type of land is heavily affected by land degradation which reduces biological productivity, ecosystem functions, and complexity.</p> <p><b>The Normalized Differentiated Vegetation Index (NDVI)</b>, obtained from Remote Sensing, is widely used to monitor rangelands. The NDVI series are <b>non-linear, non-stationary and seasonal</b>. NDVI and its relationship with meteorological variables (temperature and precipitation) have reported different results depending on the analysed spatial scale, the heterogeneity of the soil properties and topography of the terrain. However, these relationships are essential to forecast drought situations that affect in Spain.</p> <p><b>The objective of this project is to forecast the responses of the rangeland NDVI to temporal dynamics of temperature and precipitation</b> for an arid environment. Several methods will be applied, beginning with <b>Time Delay Neural Network (TDNN)</b>.</p>
<b>Applications: documents to be submitted and deadlines</b>	Letter of motivation and CV before 1 <sup>st</sup> of May