

Solar activity and Solar Weather in the framework of life origin and evolution on Earth

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INVITED

The effects of solar activity and Solar Weather have played a leading role in the origin and evolution of life on Earth. Our insights into this subject have improved considerably in recent years, due to several factors. Firstly, the advent of a long series of space missions. Secondly, improved knowledge of the Sun and Space Weather is due to a large extent to the advent of robust national and international efforts. It is the purpose of our work to reconsider two joint factors that together contribute to the origin of life. Firstly, chemical evolution that took place on Earth and possibly chemical evolution on the small bodies of the Solar System. Secondly, as our star approached the main sequence, the continually evolving early Sun was providing necessary energy requirements for the emergence of life. We discuss possible favorable, and also inhibiting effects on the origin of life by the early Sun's influence on Space Climate and Space Weather. We especially keep in mind the difficulty that knowledge of the early evolution of solar radiation still presents many challenges, the solution of which is not always free of controversy. Two major factors during this early period were the non-ionizing effects of ultraviolet radiation (UVR), as well as the ionizing effects of X- and gamma rays. By not restricting ourselves exclusively to solar effects, but rather to Space Weather effects (with possible inputs from galactic events), we gain a wider perspective of the importance of improved understanding and predictions of solar activity.