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UV radiation in planetary atmospheres and biological implications — •Petra Rettberg — DLR, Institute of Aerospace Medicine, Photo- and Exobiology, Köln, Germany

During the early evolution of life the atmosphere did not contain significant amounts of oxygen, therefore no ozone, the most important UVB absorbing component on Earth today, could be formed. Energy-rich UV radiation of short-wavelengths could reach the surface. These UV bands have a high biological efficiency in all organisms with DNA as the most important UV target in each cell. The significance of solar UV radiation as an evolutionary driving force is reflected by the development of different protection mechanisms against the deleterious biological effects of UV radiation. To reach a better understanding of the processes leading to the origin, evolution and distribution of life on Earth we have performed several laboratory and space experiments with microorganisms. The ability of resistant life forms like bacterial spores to survive high doses of extraterrestrial solar UV alone or in combination with other space parameters, e.g. vacuum, was investigated. Extraterrestrial solar UV was found to have a thousand times higher biological effectiveness than UV radiation filtered by stratospheric ozone concentrations found today on Earth. Radiative transfer models predicting a strong correlation between the decrease in biologically effective UV radiation with increasing ozone concentrations during the history of life on Earth could be validated experimentally in space.