

LIFE ON VENUS: RADIATION HAZARDS TO AN AERIAL BIOSPHERELewis R. Dartnell¹, Tom Andre Nordheim^{2,3}, Laurent Desorgher⁴, Andrew J Coates^{2,3}, Geraint H Jones^{2,3}

¹ Space Research Centre, University of Leicester, Leicester, LE1 7RH, lewis@lewisdartnell.com, ² Mullard Space Science Laboratory, University College London, Dorking, Surrey, RH5 6NT, ³ Centre for Planetary Sciences at UCL/Birkbeck, University College London, Gower Street, London, WC1E 6BT, ⁴ Laboratory for Particle Physics, Paul Scherrer Institute, Villigen, 5232, Switzerland

Although utterly incompatible with life on its surface, the environmental conditions high in the atmosphere of Venus offer a potentially habitable niche for astrobiology. Within the global cloud layers the droplets are pH 0 with sulphuric acid. Terrestrial polyextremophiles able to resist the combined hazard of high temperature and acidity grow at pH 0 only up to temperatures of 65°C, which sets the floor of a potential Venusian aerial biosphere at around 52 km altitude. High in the atmosphere, a Venusian biosphere would be exposed to the peak flux of ionising radiation from cosmic rays, and in particular to the sporadic but intense bursts of radiation from solar energetic particle events. Here we model the extensive cascades of secondary particles propagating down through the atmosphere from energetic galactic cosmic ray (GCR) and solar energetic particle (SEP) primaries in order to calculate the radiation environment and the biological hazard it presents in this habitable zone. The 1859 'Carrington Event' is taken as a worst-case scenario for sporadic but extremely high flux solar particle events.