UVC-induced photodamage and its attenuation by co-occurring stressors in the photobionts of the astrobiologically relevant lichens *Buellia frigida* and *Circinaria gyrosa*

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Previous studies investigated the viability and photosynthetic activity of lichen photobionts after exposure to simulated or real space parameters. They consistently found high viability and recovery of photosynthetic activity (de Vera et al. 2003, 2004a, 2004b, de la Torre et al. 2010, Onofri et al. 2012, Sánchez et al. 2012, 2014, Brandt et al. 2014, *in press*). To investigate such resistance in detail, we exposed metabolically active photobionts of two lichens, *Buellia frigida* and *Circinaria gyrosa*, to UVC_{254nm} alone and in combination with desiccation and cold. The effect was examined by chlorophyll *a* fluorescence and characterised by quantum yield reduction and changes in nonphotochemical quenching. The results indicate a strong impairment of photosynthetic activity, photoprotective mechanisms and overall photobiont vitality when being irradiated in the isolated and metabolically active state. Nonetheless, co-occurring stressors as desiccation and subzerotemperatures can attenuate the UVC-damage.

Our experiments stress the high susceptibility of photobionts towards UVC-exposure but also demonstrate that desiccation and cold confer an additive, protective effect on the investigated photobionts. Besides other protective mechanisms (anhydrobiosis, morphological-anatomical traits, secondary lichen compounds) the finding that the photobionts' reaction to one stressor attenuates the effect of another one – even if it is a non-terrestrial stressor as UVC – may be one piece of the puzzle to explain the consistently high resistance of lichens observed in previous astrobiological studies.