Spectroscopic studies of molecular iodine emitted into the gas phase by seaweed

http://www.firstlight.cn 2010-07-09

Time profiles of molecular iodine emissions from seven species of seaweed have been measured at high time resolution (7.5 s) by direct spectroscopic quantification of the gas phase I2 using broadband cavity enhanced absorption spectroscopy. Substantial differences were found between species, both in the amounts of I2 emitted when the plants were exposed to air and in the shapes of their emission time profiles. Two species of kelp, Laminaria digitata and Laminaria hyperborea, were found to be the most potent emitters, producing an intense burst of I2 when first exposed to air. I2 was also observed from Saccharina latissima and Ascophyllum nodosum but in lower amounts and with broader time profiles. I2 mixing ratios from two Fucus species and Dictyopteris membranacea were at or below the detection limit of the present instrument (25 pptv). A further set of experiments investigated the time dependence of I2 emissions and aerosol particle formation when fragments of L. digitata were exposed to desiccation in air, to ozone and to oligoguluronate stress factors. Particle formation occurred in all L. digitata stress experiments where ozone and light were present, subject to the I2 mixing ratios being above certain threshold amounts. Moreover, the particle number concentrations closely tracked variations in the I2 mixing ratios, confirming the results of previous studies that the condensable particle-forming gases derive from the photochemical oxidation of the plant's I2 emissions. This work also supports the theory that particle nucleation in the coastal atmosphere occurs in "hot-spot" regions of locally elevated concentrations of condensable gases: the greatest atmospheric concentrations of I2 and hence of condensable iodine oxides are likely to be above plants of the most efficiently emitting kelp species and localised in time to shortly after these seaweeds are uncovered by a receding tide.

存档文本