Explosion-combustion in exoplanetary atmospheres

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Conditions leading to explosion or combustion in exoplanetary atmospheres are investigated for different atmospheric composition, temperature and pressure. Cases considered are Super-Earths orbiting in the habitable zone of M-dwarf stars with atmospheres consisting of abiotically-produced molecular oxygen together with molecular hydrogen accreted from the protoplanetary disk. Should these atmospheres undergo hydrogen-oxygen combustion triggered by e.g. lightning or cosmic rays, this would limit the build-up of abiotic oxygen, lower the hydrogen gas envelope and could lead to liquid oceans with masses tens to hundreds of times larger than on the Earth. We also consider other explosive-combustive gas mixtures which could lead to carbon monoxide or methane combustion in the atmospheres of some Mini Gas Planets or in (Early) Earth-like atmospheres.