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Observability of Evaporating Lava Worlds

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Lava worlds belong to a class of short orbital period planets reaching surface temperatures high enough to melt their silicate crust. Theory predicts that the resulting lava oceans outgas their volatile components, attaining equilibrium with the overlying vapour. This creates a tenuous, silicate-rich atmosphere that may be confined to the permanent dayside of the planet. With the recently successful deployment of JWST it is now possible to characterise these worlds. We assess JWST observability of key spectral features by self-consistently modelling silicate atmospheres for all the currently confirmed targets having sufficient substellar temperatures. We use outgassed equilibrium chemistry and radiative transfer methods to compute temperature-pressure profiles, atmospheric chemical compositions and emission spectra. Our results indicate that SiO and SiO2 infrared features are the best, unique identifiers of silicate atmospheres, detectable using the MIRI instrument of JWST. Detection of these two species in emission would allow for strong constraints on atmospheric thermal structure and possibly the composition of the melt. We also propose that certain species, e.g., TiO or MgO, may be directly tied to different classes of melts, possibly revealing surface and interior dynamics. Currently, there are nearly a dozen confirmed lava planets ideal for characterisation using JWST, but only two of these have been accepted for the initial General Observers program.