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Strong spectral features from asymptotic giant branch stars in distant quiescent galaxies

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Dating the ages and weighting the stellar populations in galaxies are essential steps when studying galaxy formation through cosmic times. Evolutionary population synthesis models with different input physics are used for this purpose. Moreover, the contribution from the thermally pulsing asymptotic giant branch (TP-AGB) stellar phase, which peaks for intermediate-age 0.6–2 Gyr systems, has been debated for decades. Here we report the detection of strong cool-star signatures in the rest-frame near-infrared spectra of three young (˜1 Gyr), massive (˜10ˆ10 M⊠) quiescent galaxies at large look-back time, z = 1–2, using JWST/NIRSpec. The co-existence of oxygen- and carbon-type absorption features, spectral edges and features from rare species, such as vanadium and possibly zirconium, reveal a strong contribution from TP-AGB stars. Population synthesis models with a significant TP-AGB contribution reproduce the observations better than those with a weak TP-AGB, which are commonly used. These findings call for revisions of published stellar population fitting results, as they point to populations with lower masses and younger ages and have further implications for cosmic dust production and chemical enrichment. New generations of improved models are needed,informed by these and future observations.

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