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Revised chemistry of HD209458 b

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We characterize the atmosphere of the iconic giant planet HD209458 b based on a joint modeling effort of the available observations.

HD 209458 b is the first planet with a reported detection of a chemical species in its atmosphere, namely Na I, and also the one with the largest number of reported species (H I, O I, C II, Mg I, Fe II, Ca I, Sc I, H2O, CO, HCN, CH4, C2H2 and NH3). However, recent studies casted doubts on the authenticity of some detections. Most of the discrepant results are based on data obtained with different observing techniques, especially using low- and high-resolution spectroscopy. We performed a joint analysis of archive data to exploit the synergies between multiple observing techniques.

We reconciled discrepant results reported in the literature by identifying a range of planetary atmospheres that are consistent with both low- and high-resolution spectroscopic observations. The joint analysis enabled us to place tighter constraints on the chemical composition and physical state of the HD209458 b atmosphere. We discuss our findings providing an updated picture of this planetary system.