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Laboratory Ice Experiments: Interpreting and Building on JWST Early Release Science Observations

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Some fraction of cometary and planetary ice material appears to be inherited directly from molecular clouds. To understand the origin of ice molecules in the Solar System, and whether these ices include prebiotic complex organic molecules (COMs), we need to investigate the chemical evolution of ices from where they form in cold molecular clouds through inclusion in the cometary regions of protoplanetary disks. Particularly timely is the need for a global coordination of laboratory and modeling efforts in support of the JWST mission. Here, we will discuss the needs for laboratory work in preparation for the first results from the JWST Early Release Science program, Ice Age, and other Cycle 1 projects specifically focusing on ice observations. In particular, we will review the current status of laboratory ice databases, discussing their pros and cons and highlighting key parameters and requirements needed for a correct interpretations of observations, such as optical constants, band strengths and ice components with attention of complex organic species. We will also emphasize the importance of understanding surface reaction formation and destruction pathways of molecules in space to inform future observational programs with JWST.