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How the partitioning of amino acids in high-pressure ices VI and VII support habitability on large ocean worlds - *Shen-su Sun Foundation Medal Lecture*

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Water oceans in large icy moons and exoplanets are isolated from the silicate interior by thick layer(s) of high-pressure ice(s). In these large ocean worlds, water-rock interaction may still occur at the ice-silicate boundary, but high-pressure ice hinders the direct supply of nutrients and building blocks of life to the ocean. The uptake of these bio-essential compounds into high-pressure ice phases could regulate their availability in the ocean, but is poorly constrained, particularly for organic species. Here, we measured partition coefficients of glycine and alanine into ice VI and VII under elevated temperature and pressure conditions, using a diamond-anvil cell facility coupled with *in situ* Raman spectroscopy. We observed moderate incompatibility of glycine and alanine with ice VI and VII with partition coefficients: K_p of glycine = 0.14 ± 0.07 in ice VI and 0.40 ± 0.15 in ice VII; alanine = 0.21 ± 0.07 in ice VI and 0.35 ± 0.15 in ice VII. The K_p values show no discernible dependence on temperature and pressure over our investigated *T-P* ranges (0-200 °C; 0.5-3.3 GPa). Our results indicate that partitioning of amino acids into high-pressure ices may undermine the delivery efficiency of amino acids via hydrothermal plumes but would favor the potential transport via solid convection of the high-pressure ices in large ocean worlds.