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Examining diapirs as a nutrient source for plants in a High Arctic polar desert.

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Polar deserts cover a quarter of ice-free land in the Canadian Arctic, yet little is known about the key ecological processes that take place. This understudied ecosystem is becoming increasingly vulnerable to climate change and growth of the natural resource industry. In polar deserts, below ground soil masses called diapirs occur in some patterned ground features such as frost boils. Diapirs are formed above permafrost soil where increases in moisture and temperature stimulate biological activity when thawing occurs to create an organic rich, Bhy horizon. Vascular plants are scarce ($< 5\%$ cover) and nutrients for survival are likely supplied by diapirs but this interaction is poorly understood.

To determine if diapirs are an important nutrient source, nitrogen and phosphorous were traced from the diapir Bhy to vascular plants using ∂^{15}N and ∂^{18}O stable isotope signatures. Recent developments have shown that the oxygen isotopes of orthophosphate ($^{18}O_P$) can be used to trace plant-available phosphorous. At a polar desert site at Alexandra Fjord, Canada, diapir (n=12) and non-diapir (n=12) frost boils were identified in 12 blocks with a field-portable vis-NIR (visible and near infrared spectrometer) device. Soil cores and *Salix arctica* plant tissue were collected from each frost boil for stable isotope analysis. The ∂^{15}N of *Salix arctica* plant tissue (n=144) shows a significant relationship between block location and diapir presence (p=0.003). There was a consistent pattern in average ∂^{15}N in plant tissue parts with increasing concentration from leaf, stem to root in all frost boils. There was no significant difference in total plant ∂^{15}N between diapir and non-diapir frost boils but ∂^{15}N in soil cores will be measured to determine if these signatures are attributed to the Bhy horizon or biological nitrogen fixation. These results highlight the potential for stable isotopes to be used as a nutrient tracer in polar desert ecosystems and further analysis of phosphorous stable isotopes will provide a clearer picture of the role of diapirs as a nutrient source.