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Annual transcriptome dynamics of Antarctic moss, *Sanionia uncinata* (Hedw.) Loeske in natural environments reveals seasonal adaptation of extremophile plants

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Most organisms on Earth have evolved and adapted to the seasonally changing environment. The maritime Antarctic is covered with snow and ice for most of the year, but during the austral summer season, snow melts and a variety of vegetation is revealed. During this three-month period, terrestrial plants actively perform necessary cellular activities for the lifecycle under the prolonged daytimes. But even this short summer, the sub-zero temperatures, dryness, continuous strong light and UV radiation are very extreme conditions for plant growth, and after these summers are over, the snow cover starts to pile up and the plants stop growing and enter dormancy in a long and dark winter. Here, in this study, we investigated the annual transcriptome dynamics of extremophile plants to reveal the seasonal adaptation in a natural environment. During the 2015-2016 winter/summer station study, we had sampled *Sanionia uncinata*, one of the dominant bryophyte species of the maritime Antarctic, naturally habituated in the King George Island (62°14' S; 58°44' W), on a monthly basis, and conducted transcriptome analysis. As a result, we could identify groups of genes that fluctuate with rhythmicity according to the seasonal changes. The weighted co-expressed gene network analysis enabled to construct a correlation network on climate-gene expression and to identify the gene groups responding to each changing environmental component in a natural environment.

Keywords: Environmental adaptation, Field transcriptome, *Sanionia uncinata*, Antarctica,