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Equations used to simulate wintertime soil respiration.

$$T=-40+40(1 -e^{-0.0625d}) $$

**Equation 1.** Relationship between snow depth and ground temperature. This equation was parameterized with data collected in the Northern Brooks Range Foothills as reported by Zhang (2005, figure 10). In the simulations, snow depth was elevated in and immediately leeward of shrub patches, while snow depth was reduced in tussock tundra patches not immediately leeward of shrub patches. *T* = ground temperature (°C); *d* = snow depth (cm).

$$R=75.540\*e^{0.450T}$$

**Equation 2.** Relationship between ground temperature and soil respiration for tussock tundra patches. This equation was parameterized and presented by Mikan et al. (2002). This parameterization assumes sub-freezing temperatures and a constant temperature dependence of respiration. *R* = soil respiration (μg CO2-C g-1 soil C day-1); *T* = ground temperature (°C).

$$R=64.477\*e^{0.415T}$$

**Equation 3.** Relationship between ground temperature and soil respiration for shrub patches. This equation was parameterized and presented by Mikan et al. (2002). This parameterization assumes sub-freezing temperatures and a constant temperature dependence of respiration. *R* = soil respiration (μg CO2-C g-1 soil C day-1); *T* = ground temperature (°C).

**References**

Mikan C.J., Schimel J.P. & Doyle A.P. 2002. Temperature controls of microbial respiration in Arctic tundra soils above and below freezing. *Soil Biology and Biochemistry* *34*, 1785-1795.

Zhang T. 2005. Influence of the seasonal snow cover on the ground thermal regime: an overview. *Reviews of Geophysics* *43(4),* RG4002, doi: 10.1029/2004RG000157.