**Annual variation of temperature and mass balance of first-year and second-year land-fast sea ice in Prydz Bay, East Antarctica**

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**Table S1.** The basic equations and parameters of the model

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| Description | Equation |
| The partial differential heat transfer equations for the snow and ice layers | $$\left(ρc\right)\_{s,i}\frac{∂T\_{s,i}\left(z,t\right)}{∂t}=\frac{∂}{∂z}\left(k\_{s,i}\frac{∂T\_{s,i}\left(z,t\right)}{∂z}\right)+\frac{∂q\_{s,i}\left(z,t\right)}{∂z}$$ |
| Surface Heat and Mass Balance | $$\left(1-a\_{s,i}\right)Q\_{s}-I\_{0}+\left(Q\_{ld}-Q\_{lb}\left(T\_{sfc}\right)\right)+Q\_{h}\left(T\_{sfc}\right)+Q\_{le}\left(T\_{sfc}\right)+F\_{c}-F\_{m}=0$$ |
| Ice bottom Heat and Mass Balance | $$-ρL\_{f}\frac{dH\_{i}}{dt}=\left(\left(-k\_{i}\frac{∂T\_{i}}{∂z}\right)\_{bot}+F\_{w}\right)$$ |
| Snow/ice Interface and Mass Balance | $$-\frac{ρ\_{sui}L\_{f}dH\_{sui}}{dt}=\left(\frac{k\_{s}∂T\_{s}}{∂z}\right)|\_{z=h\_{s}}-\left(\frac{k\_{i}∂T\_{i}}{∂z}\right)|\_{z=h\_{i}}$$ |
| Parameter | $s$ and $i$: Snow and ice;$z$: The vertical axis;$t$: The time;$T$: The temperature;$ρ$: The density;$c$: The specific heat;$k$: The thermal conductivity;$q$: The amount of incoming solar radiation penetrating below the snow and ice surface;$Q\_{s}$: Downward solar radiation for all sky condition;$Q\_{ld}$ and $Q\_{lb}$: Downward and upward longwave radiation under all sky conditions;$Q\_{h}$ and $Q\_{le}$: Turbulent sensible and latent heat fluxes;*Fm*: Surface melting of snow or ice; *Fc*: The conductive heat flux of the surface layer;$T\_{sfc}$: Surface temperature;$a\_{s,i}$: Snow/ice surface albedo;$H\_{i}$: Sea-ice thickness;$L\_{f}$: Latent heat of fusion;$F\_{w}$: Oceanic heat flux;$ρ\_{sui}$: Density of snow-ice/ superimposed ice;$k\_{s}$: Thermal conductivity of snow;$k\_{i}$: Thermal conductivity of sea ice;$H\_{sui}$: Superimposed ice thickness |