We introduce two similar models for the formation of small scale (50 m) CO$_2$ frost halos on the South Polar Residual Cap (SPRC) of Mars, and for large (20 km) bright Aureoles around Triton’s Zoned Maculae on the southern hemisphere (fig. 1).

Both Mars and Triton have a so-called “Vapor Pressure” atmosphere, in which the main constituent of the atmosphere exists both as a vapor in the atmosphere and a condensate (i.e. “ice”) on the surface [1]. Our models for the features mentioned above track the distribution of surface ice (CO$_2$ on Mars and N$_2$ on Triton) throughout the year, by calculating the sublimation/condensation rate of frost in an energy balance equation [2]:

$$\frac{dm}{dt} = S_0 \cos(i)(1 - A) - \epsilon \sigma T^4$$

The first term on the right side represents insolation; the second term represents the energy radiated by the surface ($L$=Latent heat of sublimation of CO$_2$, $S_0$=solar constant, $A$=geometric albedo, $i$=incidence angle, $\epsilon$=emissivity, $\sigma$=Stefan Boltzmann constant, $T$=surface temperature). The models solve this equation for the sublimation rate on three adjacent surfaces on their respective planets (and with the corresponding scales: ~1m$^2$ on Mars and 100m$^2$ on Triton). A schematic of the models is shown in figure 2.

In both cases, a thicker layer of frost exposing younger ice should be present on surfaces adjacent to the “source” surface (cell 0), where a higher sublimation rate occurs. We present preliminary model results that show that a difference in frost accumulation can in fact be the result of a slope on Mars and of a preexisting darker surface on Triton (fig. 3). This may mean that older ice is being exposed on surfaces that are distant from cell 0. Since older ice is coarser-grained and therefore darker than fresh frost, an albedo difference should emerge between surfaces adjacent to the source and ones distant from it.