In support of Vaughan's hypothesis, I wanted to chime in with some evidence we have recently come across of potential sublimational SIP. Specific differential phase (K_{DP}) has recently been proposed as a potential marker of SIP zones as it is sensitive to large concentrations of anisotropic fragments, but this has so far been limited to SIP during riming (e.g., Grazioli et al. 2015; Sinclair et al. 2016; Kumjian and Lombardo 2017). However, looking at quasi-vertical profiles (QVPs) we have recently found bands of enhanced K_{DP} situated squarely within the sublimation zone in 9 of 12 cases of strong sublimation, coincident with gradients of Z and RH w.r.t. ice (taken from coincident RAP analyses). We are currently exploring these signatures more quantitatively. However, given the observational laboratory evidence for sublimational SIP (e.g., Oraltay and Hallet 1989; Dong et al. 1994; Bacon et al. 1998), I contextualized these signatures with the existing literature by emulating Fig. 13 of Oraltay and Hallett (1989; reproduced below) and plotting the median K_{DP} as a function of RHi and ice bulb temperature. Note that Oraltay and Hallett (1989) only included down to 50% RHi and -6C for ice bulb temperatures, so my figure is an extrapolation and it is unclear whether their 70% RHi threshold is maintained at much colder ice bulb temperatures. Regardless, it is apparent that these regions of enhanced K_{DP} indicative of high concentrations of highly anisotropic particles are concentrated primarily in the region identified by Oraltay and Hallett (1989) as the favorable zone for sublimational breakup. The plot using mean K_{DP} was similar. These sorts of values are not likely to be due to aggregates which we believe characterize the majority of parent particles in the cases examined, and riming is precluded due to the degree of dry air present. Thus, although the use of K_{DP} is indirect evidence, under proper conditions (e.g., a continual and sufficiently high flux of parent particles into a sufficiently dry layer and favorable particle habits), I believe Vaughan's hypothesis of an equilibrium being established between fragment generation and fragment consumption to be plausible.

Jacob Carlin

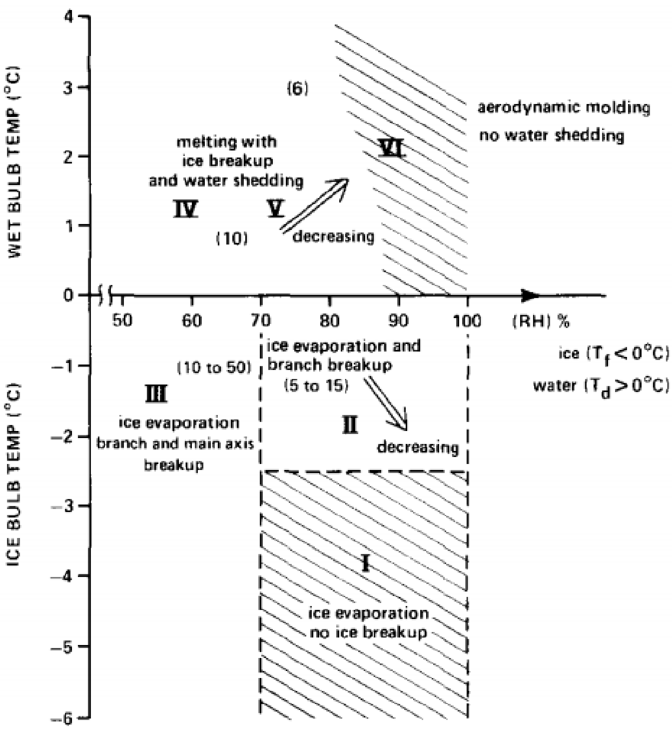
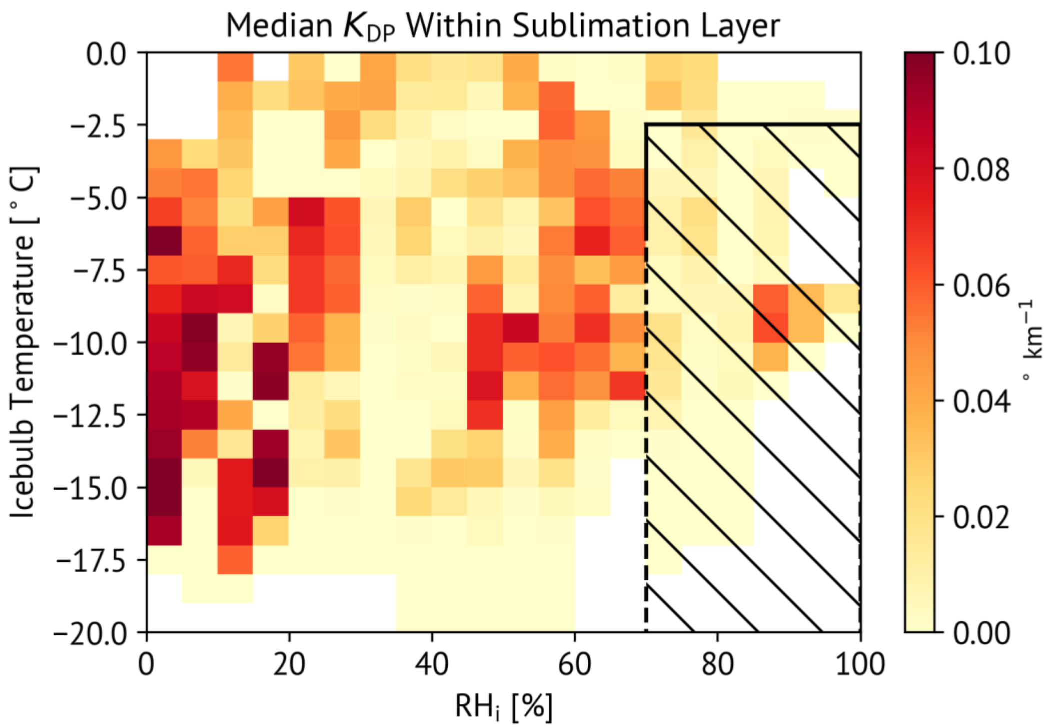


Fig. 13. Display of the conditions for ice-breakup and water-shedding during evaporation and melting of dendritic ice crystals. Numbers of secondary particles per 5 mm crystal are indicated in parentheses.

(Reproduced from Oraltay and Hallett 1989)


Median K_{DP} Within Sublimation Layer
Icebulb Temperature [$^\circ$C]
0.0
−2.5
−5.0
−7.5
−10.0
−12.5
−15.0
−17.5
−20.0
0
20
40
60
80
100
RH_i [%]
0.10
0.08
0.06
0.04
0.02
0.00
$^\circ$ km^{-1}