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Solutions!

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New Methods : Less Shatter

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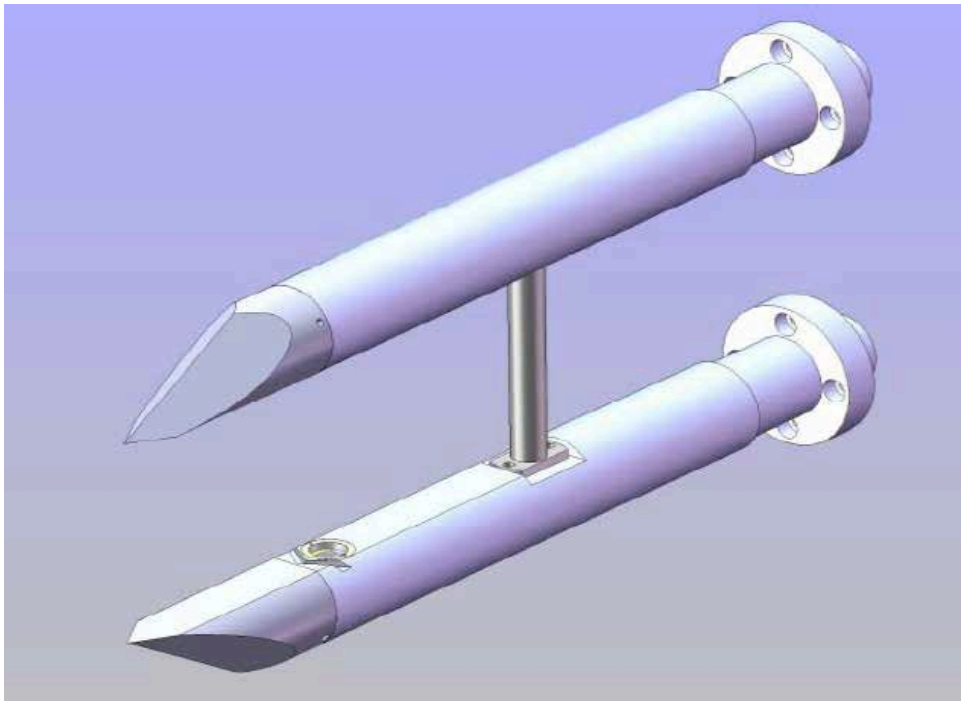

Modified cloud probe (Korolev et al., EC): in use since ~2010. Appear to measure better; e.g. 10's to 100's per liter ice (not 10's- 100's per cc !)

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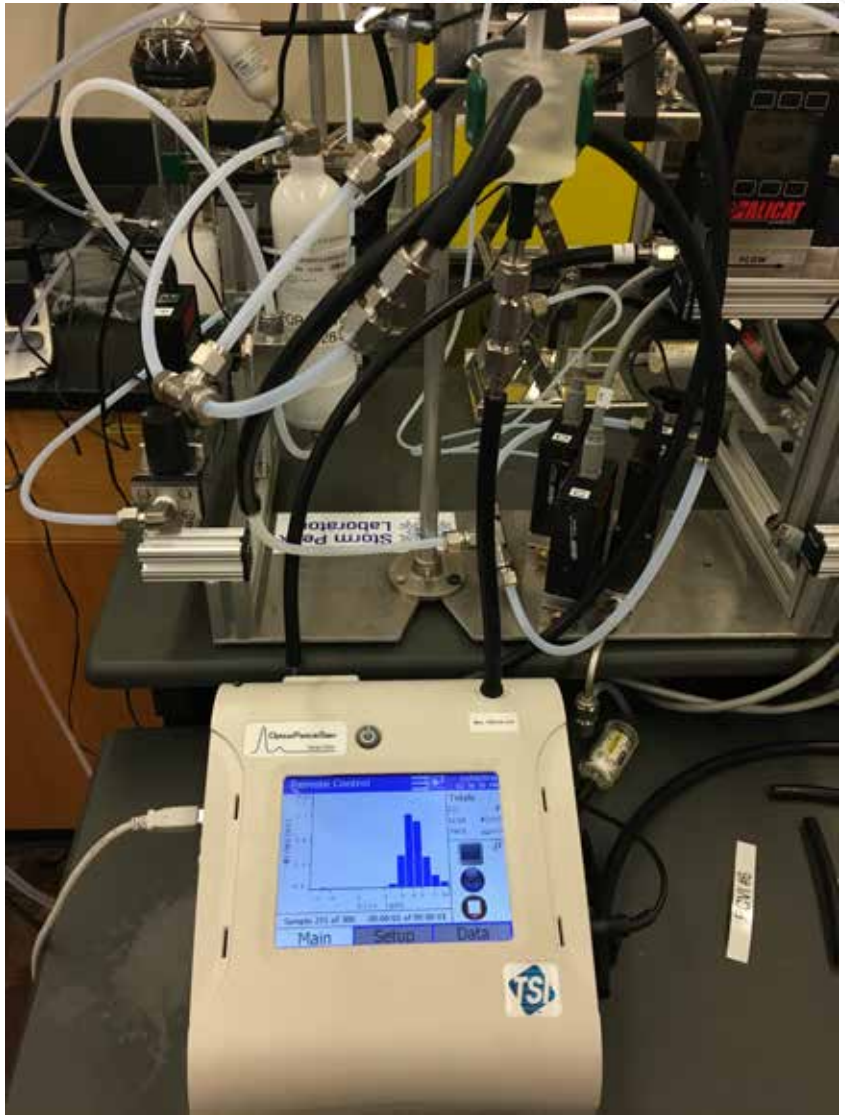

FormLabs and Roesch, Koolik, in prep, 2017

This Is An Important Lesson!

- These instruments helped launch our field

- However, idealized instruments don't exist in the real world

- Any measurement should be re-evaluated, especially in light of conflicting data

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What Have We Learned? (Earth)

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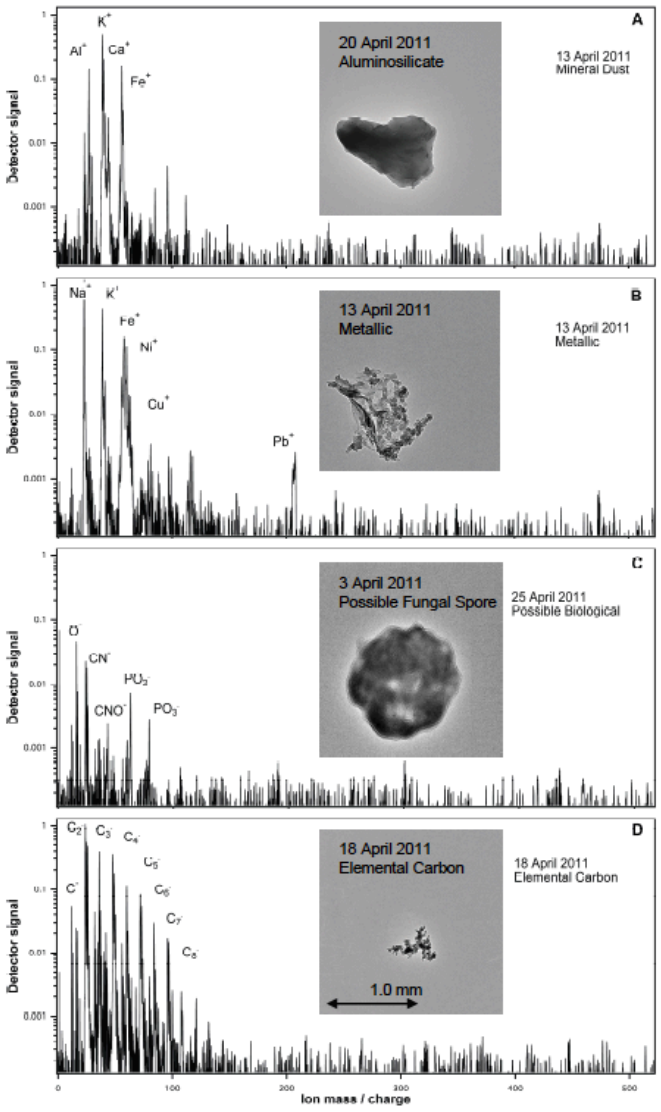
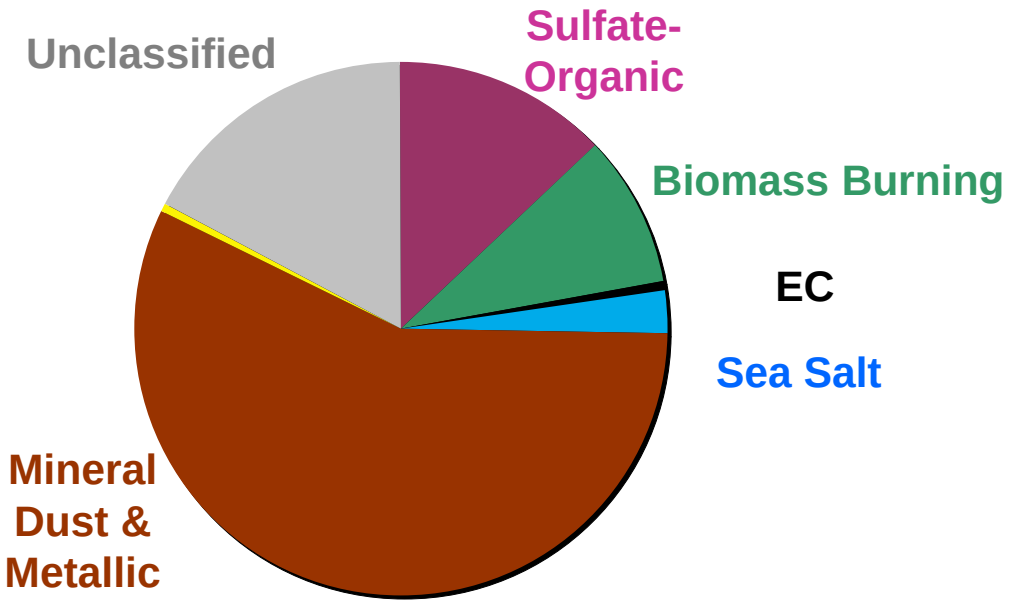
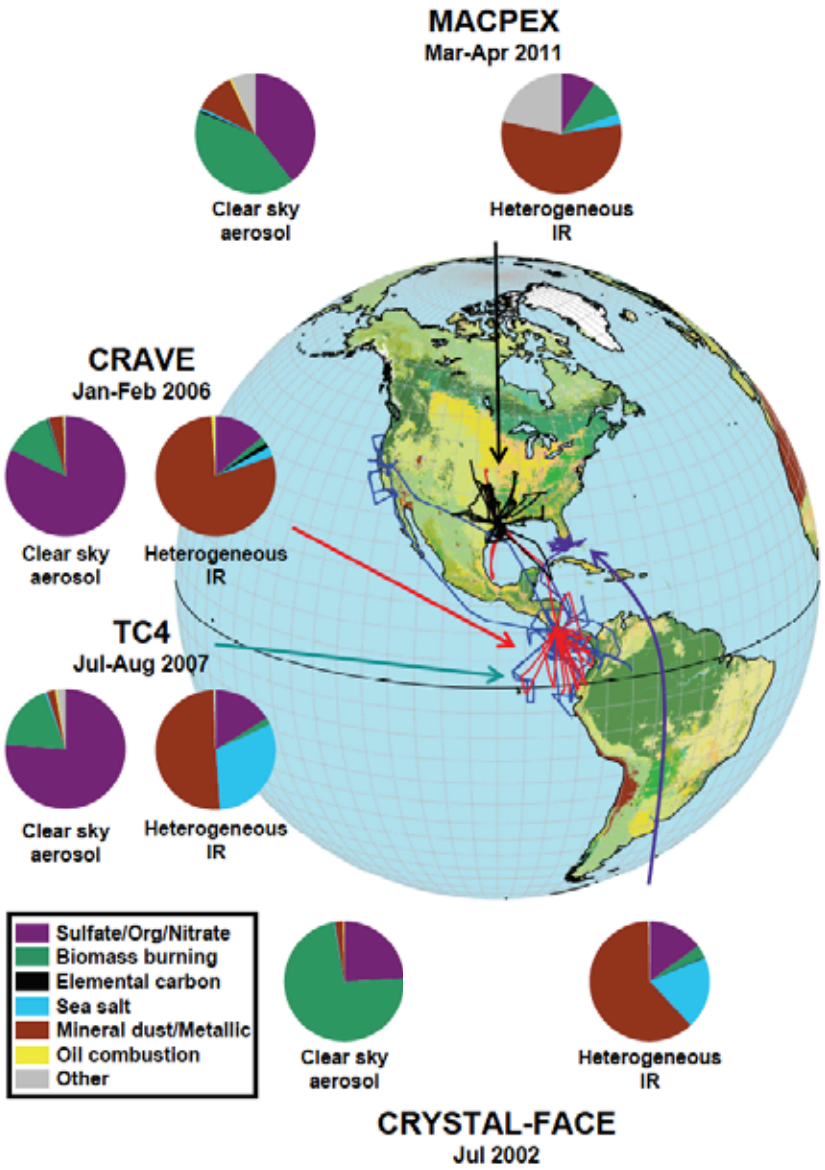
Aside: Categories





Almost infinite data in mass spectrometry and electron microscopy must be simplified for modeling!

Results from IRs



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Results:

1. The majority of cirrus Irs were mineral dust and metallic particles (>60%) (even though they were a few % of the background)

2. Only 2 flights in 29 appeared to be from homogeneous freezing

3. Commonly inferred IN from biological material and black carbon were <1% of the IRs

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Reaching For The Stars

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On Mars : Water and CO_2 Ice

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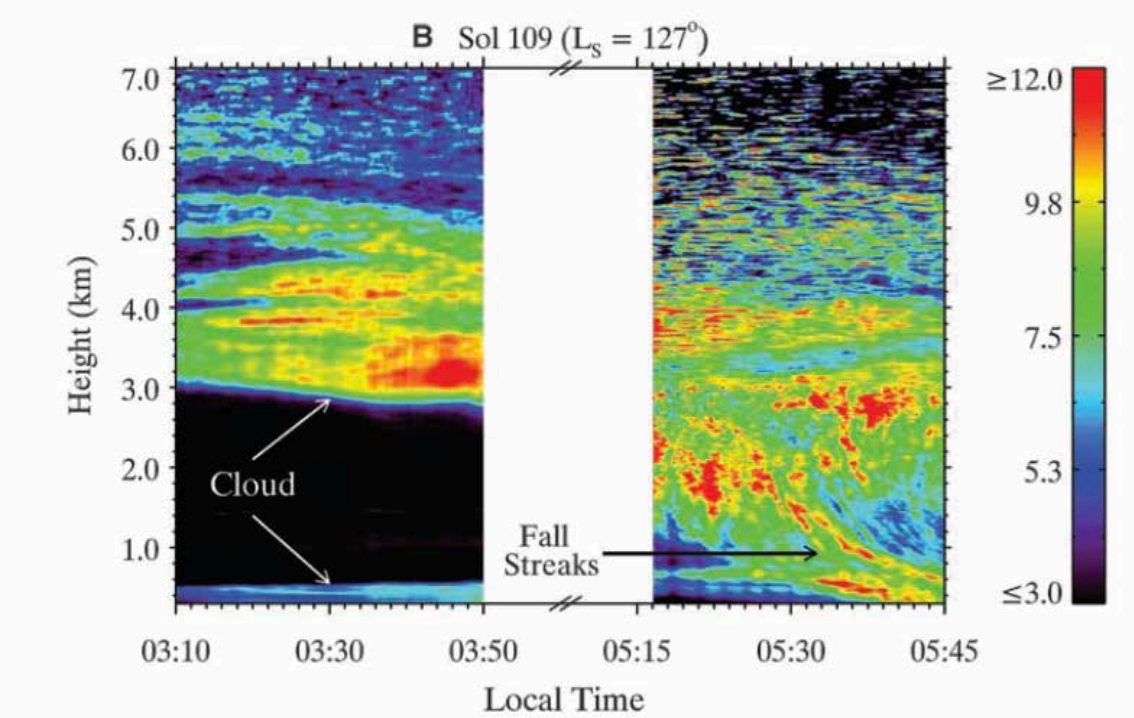

Important in the water cycle of planets such as Mars

More complex : water, carbon dioxide, and mixed composition

Current assumption of equilibrium (100% RH) conditions or terrestrial cirrus (130% RH) (incorrect!)

Mars Water-Ice Clouds and Precipitation
J. A. Whiteway, *et al.*
Science **325**, 68 (2009);
DOI: 10.1126/science.1172344

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What Particles To Use?

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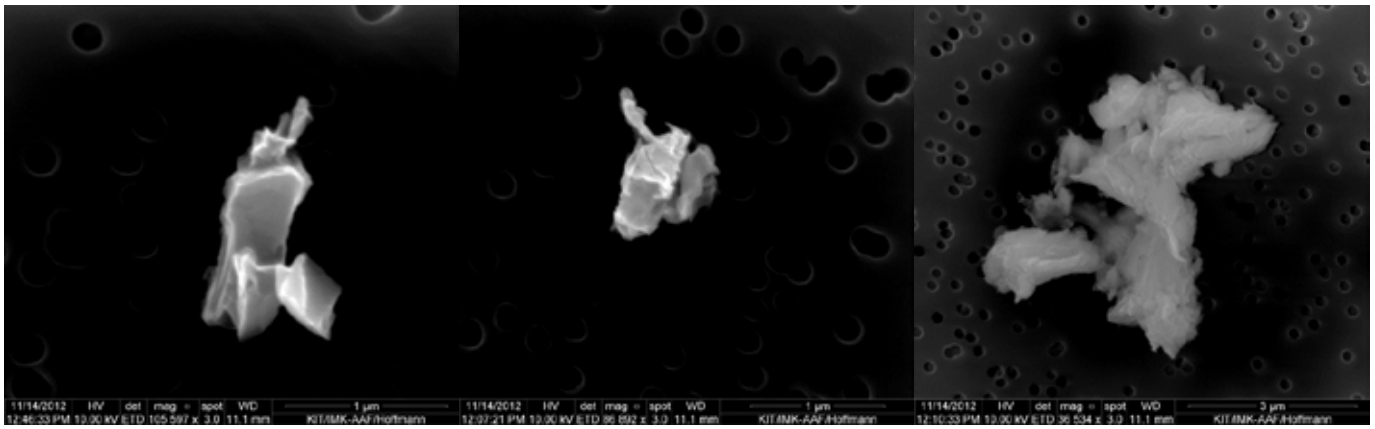

"Mars Mojave Simulant" : Peters, G. H., W. Abbey, G. H. Bearman, G. S. Mungas, J. A. Smith, R. C. Anderson, S. Douglas, and L. W. Beegle (2008), Mojave Mars simulant—Characterization of a new geologic Mars analog, Icarus, 197, 470–479.

Cziczo et al., JGRP, 2014

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