Review of Richardson & Stephens paper:

This is a very interesting and valuable study. I would be very interested to know how this study could transfer to airborne spectrometers like AVIRIS and PICARD that also have high spectral resolution and lack IR channels for cloud top retrieval. We've done a similar thing with ASTER: used an instrument that was previously only for clear-sky work and created a product from unused data. The paper is overall well written and methods are clearly described and understandable.

Major comments:

Marine SCu frequently have some kind of aerosol sitting on top of them especially off the coast of Africa (Sahara dust and Namibia smoke) and to a lesser extent the US Pacific Coast (mostly smoke). Have you tried inserting above-cloud aerosol layers into your simulations and seeing what happens? I'm not saying that you have to correct for aerosols but some idea as to uncertainty introduced by absorbing aerosols would be nice.

Please be consistent in definition of micro-window. You use "pixels" in the first 8.5 pages of the paper and then switch to "channels" for the rest of the text. I personally would prefer you use "channels", but you can use whichever you see fit as long as it's consistent throughout.

Minor comments:

Figure 3 caption should read $\mu_0^{-2}=\cos^{-2}(SZA)$, μ is normally used to indicate sensor zenith angle.

Page 1 Line 1: please expand CALIPSO acronym, first use
Page 2 Line 21: should read "equator crossing time near 13:30"
Page 7 Line 25: please clarify what the micro-windows are measured in: 500 of what? Later in the text, on page 9 it becomes clear that the units of the micro-window size are channels. For folks that don't normally use something like OCO, it might help giving a bit more information, like what a 75-channel micro-window translates into as far as a wavelength range goes. It would make the research more transferable to other instruments as this is a potentially very valuable retrieval approach.
Page 9 Line 3: please use θ_0 and μ_0 as is generally customary for solar zenith angle and its cosine
Page 9 Line 20: "highest mean information content2. " A typo?
Page 10 Line 26: OCO is in the constellation with Aqua, so you may be able to use the MODIS multilayer cloud map in order to stay away from cirrus. That's just what that map is for.