Reply

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The main issue of Sanders' comments on my brief article is the level of the system that developed during the related picture sequence. Possibly my narrative was not clear enough in this respect. I can see how one might infer that the circulation center mentioned was at the surface—even though it was never stated as such.

We must remember that the frontal band discussed here is a three-dimensional structure extending well into the troposphere, with the developing circulation being at the level of the clouds defining it. Frequently, in a cold core system of this type, we will see a middle or upper tropospheric center before the surface system becomes well organized. This, in fact, is all the more reason to heed this particular satellite warning, which heralded the future surface development, illustrated in Fig. 4 of Sanders' comments.

One other important point to remember is that the surface center is most often obscured in satellite pictures by the extensive cloud shield above it, at least until the surface low becomes nearly vertical with the upper system. Note also that I refer to the "higher clouds defining the center." This statement implies a circulation aloft, not at the surface.

Sanders' reassertion that satellite data should be used in conjunction with conventional observations is well taken, and is strictly adhered to operationally. I regret any implication to the contrary. The main purpose of my brief presentation was merely to illustrate the dramatic evolution of a portion of this cloud system into a well-defined closed circulation in such a short period of time.