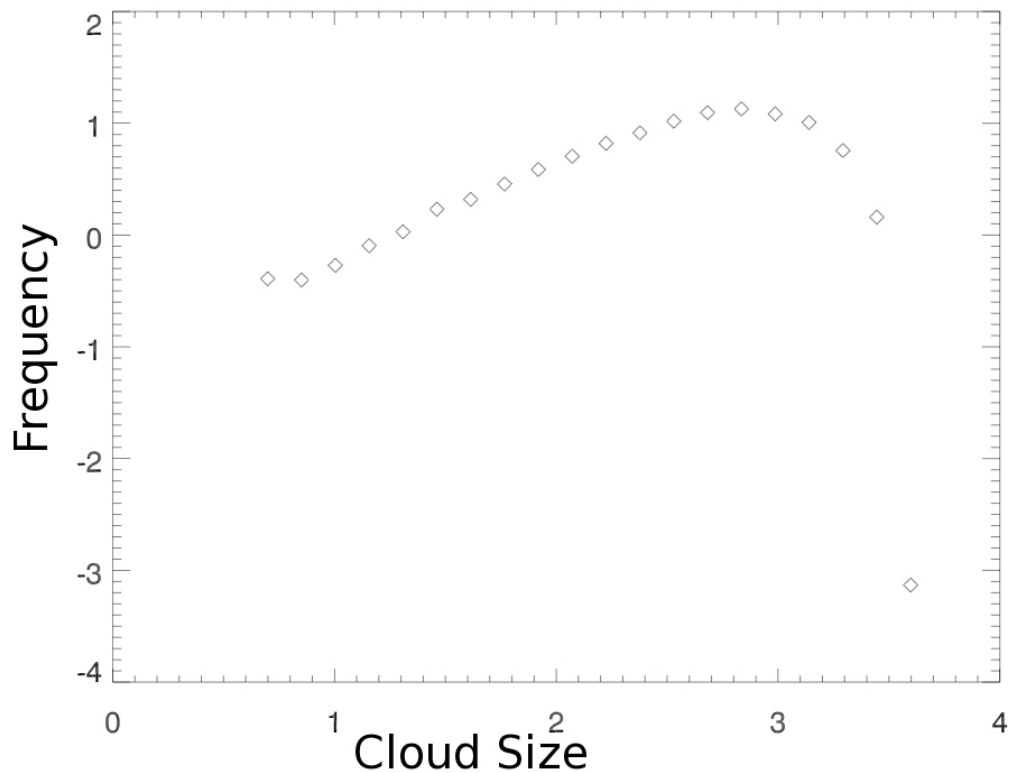**Supplementary Online Material (SOM)**

1. **Determining cloud size**

The program used to determine cloud sizes works like the following. First, it applies all the filtering as discussed in the text to MODIS cloud mask data. The resulting cloud mask image is further processed to remove cloud sizes smaller than roughly 5 pixels. Then the algorithm determines the size of each cloud cluster recursively. We only consider two pixels as adjacent when they are directly related by a common pixel edge. The diagonally related pixels are not considered connected. We did test the sensitivity of our results to this choice and it is not very sensitive.

2. **Size distribution of stratocumulus sheets**

This is the cloud size distribution for open cell convection region over the Southeast Pacific during the same month as in the text. The distribution is clearly showing different characteristics.