Arguments against a physical long-term trend in global ISCCP cloud amounts

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Introduction
The International Satellite Cloud Climatology Project (ISCCP) multi-decadal record of cloudiness exhibits a well-known global decrease in cloud amounts. Here we show that trends observed in the ISCCP data are satellite viewing geometry artifacts and are not related to physical changes in the atmosphere.

Satellite Zenith Angle: The angle between nadir (looking up from the surface of the Earth) and the satellite sensor
Mu: The cosine of the satellite zenith angle, 1/\(\mu\) is proportional to the path length a photon will travel from the surface of the Earth to the satellite sensor
Limb darkening: Water vapor emission at low \(\mu\) values which make the surface appear cool

A time series of global mean (IR) total cloud cover
This time series shows the iconic decrease in global cloud amounts from the mid-1980s through the early 2000s. These cloud amounts are generated from a single (IR) channel retrieval.

Time series without polar data from the NOAA satellites
Data from the AVHRR is used at the poles to supplement the geostationary record. By only looking at the time series for 60S–60N (above plot) we can better isolate the pattern of cloudiness from the geostationary based instruments

Identifying regions that contribute to the low frequency variability

We identify areas that contribute the greatest to the low frequency variability in the ISCCP cloud time series by linearly regressing the global maps of IR cloud amounts against the smoothed time series of mean 66S–66N cloudiness (thick black line from plot in previous panel).

The regions with the strongest (positive and negative) regression coefficients are areas at the limbs of the geostationary satellites

A few events that shape global ISCCP cloud amounts
- Failure of GOES 6
- Increase in global satellite zenith angle
- Increase in global cloud amounts
- Launch/Reposition of METEOSAT
- Decrease in global satellite zenith angle
- Decrease in global cloud amounts
- The Repositioning of a METEOSAT satellite in 1998 caused a local change in cloudiness of about 20%
- The International Satellite Cloud Climatology Project (ISCCP) multi-decadal record of cloudiness exhibits a well-known global decrease in cloud amounts. Here we show that trends observed in the ISCCP data are satellite viewing geometry artifacts and are not related to physical changes in the atmosphere.

What’s next?
We are developing new techniques to create a 3-hourly record of global cloud amounts based on data from the AVHRR. Preliminary work suggests that this new cloud data may be suitable for climatological studies since it exhibits no long-term, systematic biases.

Further information