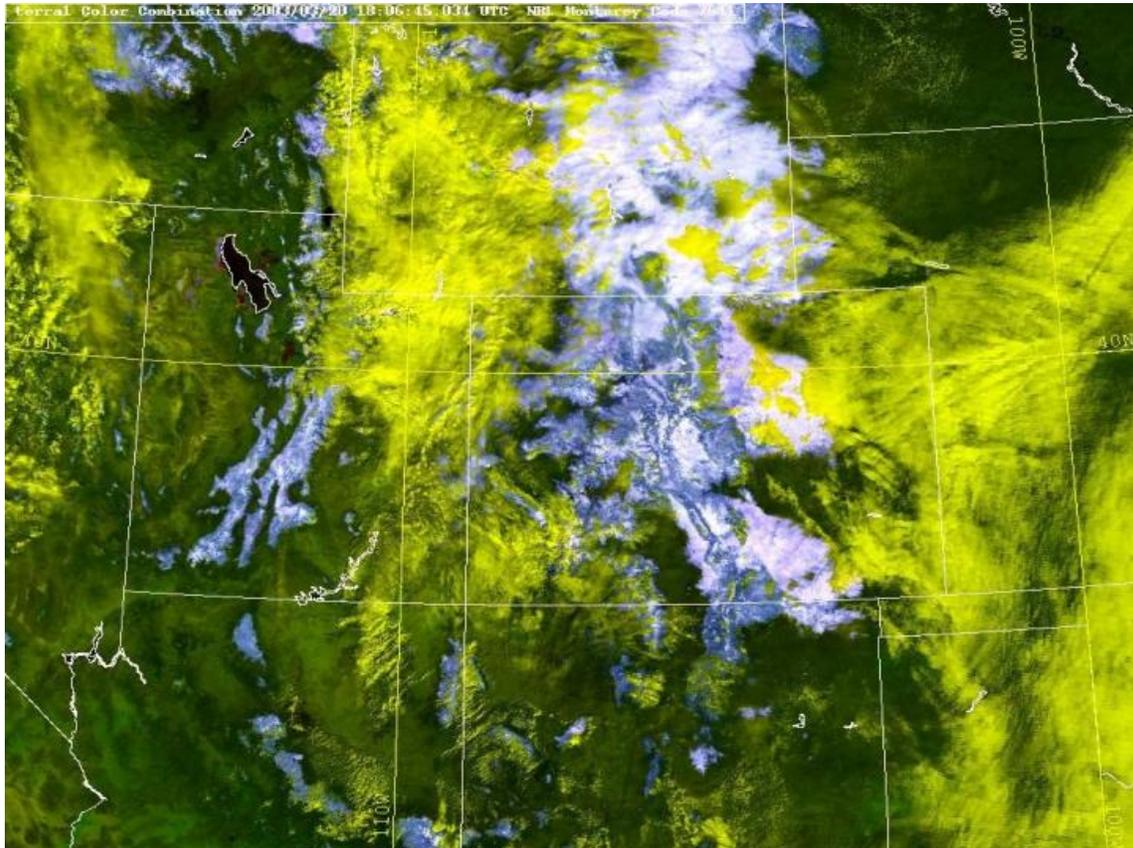




Satellite Product Tutorials:

Cloud/Snow Distinction



Above: Snow on the ground appears as a cyan/white on this enhanced image of the western United States centered on Colorado. Clouds are shown in yellow, and snow-free land in shades of green. On traditional daytime (visible channel) satellite images you can't distinguish clouds from the snow on the ground because both appear white. However, the MODIS instrument allows us to combine multiple channels having varying sensitivity to clouds and snow in creating this advanced product in color.

Why We're Interested...

Days are short in winter, and weather forecasters and other public agencies depend on satellite imagery to show them where snow covers the earth. This knowledge is important for search and rescue, flood forecasting, water supply monitoring, numerical weather prediction, recreation, and military operations in mountainous terrain. Satellites offer us a distinct advantage in areas where there are few ground observing stations.

How This Product is Created...

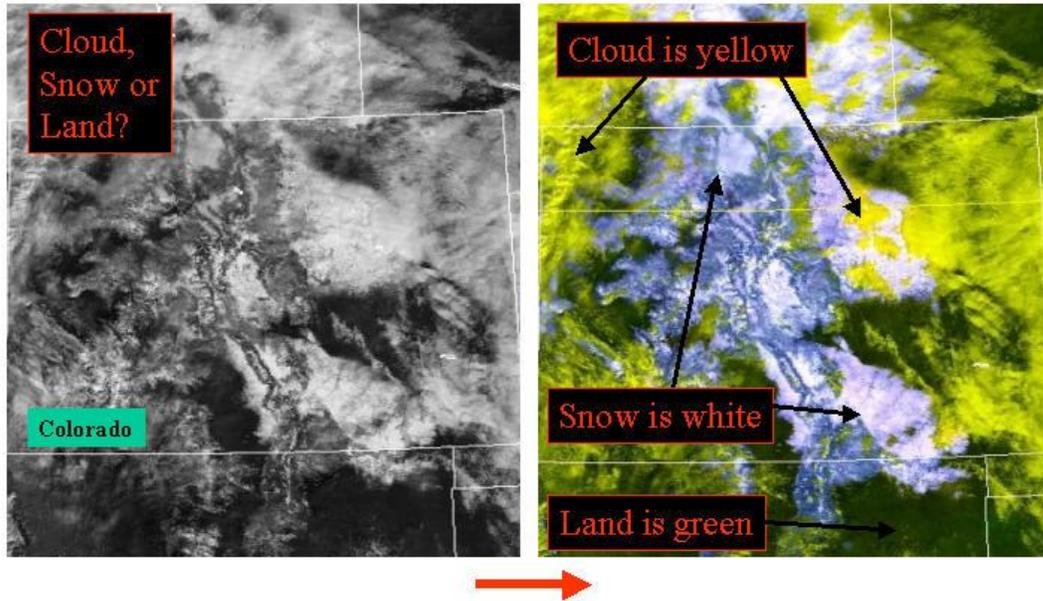
Snow on the ground reflects the sun strongly at one of the MODIS wavelength channels (0.6 μm) but very little at another (1.6 μm). Water clouds reflect the sun well at both wavelengths. The product above uses these channels, as well as some additional wavelength channels (e.g., 1.38 μm , to screen out cirrus clouds), to distinguish between snow and clouds on color products. Products combining several wavelength channels are called "multi-spectral", and help make interpretation easy for weather forecasters and the general public by providing all the salient information in a single graphic.

How to Interpret...

The left image below shows a visible image zoom of the same example above over Colorado. It is hard to tell what is cloud, cloud-free land, or snow on the ground. Both features appear white. But the cloud/snow distinction image on the right shows cloud as yellow, snow as cyan/white, and cloud-free land as green. Thus, the guesswork has been taken out of the process.

MODIS Visible image cannot distinguish Clouds from Snow on the Ground

Cloud/snow Distinction Product Distinguishes between Clouds and Snow on the Ground



Looking Toward the NPOESS Era...

Several of the channels used to make this product will have higher spatial resolution on the NPOESS Visible/Infrared Imaging Radiometer Suite (VIIRS) sensor. Thus, in the NPOESS era this product promises to be sharper and clearer. Certainly it will arrive much sooner after the satellite passes overhead, accelerating timely response by decision makers in emergencies. Additionally, the NPOESS VIIRS sensor will be able to see snow on the ground at night using a unique low-light visible sensor.

Did You Know...?

Some climate researchers believe that global warming will elevate average mountain snow levels in places like California during the coming decades, causing havoc to state water supplies. No one knows for sure, but NPOESS snow products will help monitor mountain snow trends accurately.

Want to Learn More?

Visit the MODIS [Snow and Sea Ice Global Mapping Project](#)

Author: NRL Monterey (webmaster@nrlmry.navy.mil)

Last Updated: 1/6/2006