ERS 186 Study Question Set # 4
Due May 29, 2008

1) Why does Lake Tahoe water appear blue? Discuss in terms of absorption and scattering.

Water absorbs least strongly in the blue.
Scattering is greatest at shorter wavelengths such as in the blue.
→ Water appears blue.

2) What is the best wavelength range for distinguishing land from water? And clouds from snow?

Land vs. water: NIR & SWIR
clouds vs. snow: SWIR

3) What is SeaWiFS?

Sea-viewing Wide Field of View Sensor, SeaWiFS, is a satellite sensor monitoring ocean color.

4) What is NPOESS?

National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a system of polar orbiting satellites that will collect data about weather, the atmosphere, the oceans, and the land surface. Planned sensors include infrared and microwave sounders; WINDSAT, for detecting ocean wind speeds and direction; and a visual infrared imager radiometer suite (VIIRS) which will have 9 bands in the NIR, 8 in the SWIR, and 4 in the TIR, and is the successor to AVHRR and MODIS, with capabilities including ocean color monitoring.

5) You work for the National Weather Service and you know a hurricane is forming in the Gulf of Mexico. Describe the data you would want to have to predict the track of the hurricane onto landfall?

To predict hurricane track, I would assimilate satellite observations into a weather model. Useful data would have high temporal resolution, i.e., from a geostationary satellite or one with a high repeat interval and includes sea surface temperature (from a thermal sensor), wind speeds and direction (from a radar satellite such as QuickSCAT), atmospheric profile information (from a sounder), rainfall and precipitable water information (from a passive or radar microwave sensor), and storm position (ie, cloud detection from an optical sensor).

6) Why are environmental scientists concerned about increasing concentrations of trace gasses in the atmosphere, if they are such a small fraction of the total atmosphere?

Trace gases may have much larger effects on the greenhouse effect and global climate than the gases that dominate the atmosphere. Trace gases such as CO_2 and CH_4 absorb in the thermal infrared much more effectively than do N_2 and O_2, altering the earth's radiation budget and contributing to global warming.

7) What is the IPCC and why do governments listen to their reports about predicted climate change?

The intergovernmental panel on climate change (IPCC) is an international group of scientists studying climate change. Governments should listen to their reports because they are the consensus of the scientific community.

8) Why is water vapor sometimes said to be 'the most important green house gas?'

Water vapor is the most abundant greenhouse gas in the atmosphere and it absorbs strongly.

9) Name three ways that satellites have improved predictions of severe storms.

Storm tracking – optical detection of clouds.
Estimation of rainfall rate from microwave sensors.
Wind data from scatterometers and water vapor images.
Atmospheric sounders to detect the vertical distribution of water vapor in the atmosphere and microwave sensors to detect rainfall and atmospheric liquid water.
Dust and smoke detection to predict effects on cloud formation and subsequent weather systems.
Surface temperature from thermal sensors.

10) What are the main characteristics of a GOES and POES sensors?

Polar orbiting satellites (POES) are in low orbits that pass near the poles. They are sun synchronous, meaning they always pass over a given latitude at the same time.
Geostationary satellites (GOES) orbit farther away from the earth at the same speed as earth's rotation in order to maintain position over the same location.