MAGIC

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In many ways MAGIC is all about water. Of course this may seem obvious, as MAGIC will take place over the Pacific Ocean, but many if not most of the measurements are directly water-related. Clouds are merely water in the form of small drops (or, in the case of cirrus clouds, small ice crystals). Clouds, and water vapor, absorb outgoing infrared radiation (which in this sense does not mean radioactivity but rather light with frequencies less than red light, as discussed in the second update: http://www.ecd.bnl.gov/MAGIC/MAGIC%20update%202011-11-30.pdf) from Earth's surface, resulting in a warming of the planet. This effect is why it is typically warmer on a cloudy night than on a clear night. Many aerosol particles are hygroscopic, which means that they readily take up water and increase their sizes, changing their properties as a result. Radiation from the sun (that is, light in its various forms, including visible light, infrared, and ultraviolet), scatters off of clouds and aerosol particles. As nearly all of Earth's energy comes from the sun, understanding the behavior of this incoming radiation and how it is transferred is important to understanding climate.

Water, of course, is magical in many ways. One way is that it transports heat incredibly well, and it does so in two basic forms. So-called "sensible heat" is related to the increase in temperature of the water. A raindrop at 20°C (near room temperature) carries more energy in the form of sensible heat than a raindrop of the same size at 10°C (it isn't twice the amount because water at 0°C still has energy). The other type of heat is "latent heat," which refers to the energy involved in evaporating the drop. Evaporation of water requires an immense amount of energy, and conversely condensation of water releases an immense amount of energy. To put this in perspective, the amount of energy required to evaporate a water drop at 20°C is more than 25 times the amount of energy it takes to raise the temperature of the drop from near freezing at 0°C up to 20°C. Thus, the processes of evaporation of water from the sea surface, its transport as water vapor to cloud height, its condensation to form cloud drops which may eventually become raindrops, and their descent, during which they can exchange energy with the surrounding air as both sensible heat and through evaporation as latent heat as they fall, all redistribute energy throughout the lower atmosphere, with associated changes the temperature profile and thus the stability and dynamics of the atmosphere.

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All updates and other MAGIC information can be found at http://www.ecd.bnl.gov/MAGIC.html.