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ICETOP: THE SURFACE COMPONENT OF ICECUBE

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IceCube is a neutrino telescope being constructed by an international collaboration at the South Pole. In a separate paper submitted to this meeting, James Madsen provides an overall description of IceCube and its science objectives. This paper describes, in more detail, IceTop -- the surface component of IceCube -- which detects cascades of particles generated by interactions of high-energy cosmic rays in the atmosphere. The cascading secondary particles produce light as they travel through ice. This light is captured by digital optical modules consisting of glass spheres that hold photomultipliers and the electronics needed to digitize and time-stamp the signal. Identical modules, integrated into a common data acquisition system, are used on the surface and deep in the polar ice. The surface array, together with the rest of the telescope, forms a three-dimensional air shower array with the ability to measure and reconstruct downward going events originating in the atmosphere As an air shower array, IceTop will be able to measure cosmic rays with energies from 300 TeV to one EeV The ratio of shower size at the surface to the signal of penetrating muons in the deep strings in events that pass through both parts of IceCube is sensitive to the composition of the primary cosmic rays. We expect to be able to make a new and better measurement of the relative abundance of light and heavy nuclei as a function of energy in this range. We are constructing IceTop from 2.5 cubic meter blocks of clear ice in light tight enclosures. After the recently completed 2005-06 austral summer season, IceCube consists of 9 strings in the deep ice and 32 surface detectors. In this paper we focus on the design and operation of the apparatus that produces the clear ice blocks in situ at the South Pole and also on how IceTop operates as an air shower array. Examples from actual data are presented to show the scope and reach of what we have added to the array this year, and how the surface and deep arrays complement each other in achieving the overall IceCube objectives. Plans for completion of the array are also discussed. Presented on behalf of the IceCube collaboration, which is supported by numerous funding agencies.