The unique scientific capabilities of the Advanced Technology Solar Telescope

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The 4m Advance Technology Solar Telescope (ATST) will be the most powerful solar telescope and the world's leading resource for studying solar magnetism that controls the solar wind, flares, coronal mass ejections and variability in the Sun's output. An overview of the science goals and observational requirements of the ATST and a brief summary of the design status of the telescope and its instrumentation will be given.

As its highest priority science driver ATST shall provide high resolution and high sensitivity observations of the highly dynamic solar magnetic fields throughout the solar atmosphere, including the corona. With its 4 m aperture, ATST will resolve features at 0."03 (20km on the sun) at visible wavelengths. The science requirement for polarimetric sensitivity (10^{-5}relative to intensity) and accuracy (5×10^{-4}relative to intensity) place strong constraints on the polarization analysis and calibration units. A high order adaptive optics system delivers a corrected beam to the initial set of state-of-the-art, facility class instrumentation located in the Coude lab facility. We will emphasize the science that the unique capabilities of the ground-based ATST will enable. For example, the prospect of highly sensitive polarimetric observations in the near-infrared (and at longer infrared wavelengths) at high spatial resolution (0."08 @ 1.6 micron), that can be achieved from the ground in a consistent manner over long periods of time is particularly exciting. Instruments can also be mounted at the Nasmyth focus. For example, instruments for observing the faint corona preferably will be mounted at Nasmyth where maximum throughput, and minimum stray light is achieved. The initial set of first generation instruments includes: the Visible-Light Broadband Imager (VLBI), the Visible Spectro-Polarimeter (ViSP), the Near-IR Spectro-Polarimeter (NIRSP), which includes a coronal module, and the Visible Tunable Filter.