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The Sun as a new laboratory for cosmic rays, gamma rays, neutrinos, and dark matter

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The Sun must shine brightly in GeV—TeV gamma rays and neutrinos. These particles are produced by the interactions of cosmic rays with solar matter and radiation. Additional fluxes may be caused by the annihilation of dark matter in the solar core, perhaps with the eventual particles produced outside of the Sun through the decay of metastable mediators. Importantly, a new generation of experiments is reaching the sensitivity required to detect the Sun at high energies. In gamma rays, the Sun has been detected in the GeV range by Fermi and will soon be studied in the TeV range by ARGO-YBJ, HAWC, and LHAASO. In neutrinos, IceCube is nearing the sensitivity required to detect TeV neutrinos. I will detail the physics prospects for what these observations will teach us about cosmic rays in the inner solar system, solar magnetic fields, and dark matter. This talk will highlight work from our group, including [arXiv:1508.06276](#), [arXiv:1612.02420](#), [arXiv:1703.04629](#), [arXiv:1703.10280](#), as well as the rapid growth in interest from other groups.

Primary author: ZHOU, Bei (CCAPP, OSU)

Presenter: ZHOU, Bei (CCAPP, OSU)

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