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On the astrophysical value of larger, yet achievable UHECR detectors

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The last decade has established UHECR physics as a phenomenologically rich and experimentally mature science. Key observations related to the UHECR energy spectrum, composition and distribution over the sky have clarified a few basic open question, and raised new, unexpected ones. The absence of a clear signal of anisotropy or correlation with some classes of astrophysical objects, although in line with some indications of the presence of heavy nuclei among the UHECRs, has raised doubts about the utility of pursuing the quest for the highest energy particles in the universe. We discuss why the quest should not stop now, and argue that expanding our observational capabilities at 10^20 eV is bound to give us key information. In particular, we show that the GZK effect remains our best ally to reduce the number of contributing sources to a handful, easier to separate on the sky, from which the deflection angular size, the source density, and thus the individual source power or UHECR energy budget can be obtained. This would be of tremendous value for the astrophysical understanding of UHECRs, of their sources and of their acceleration mechanism. An acceptance close to 10^6 km2 sr yr, with full sky coverage at 10^20 eV may thus be regarded as a high priority goal in astroparticle physics as well as high-energy astrophysics in general.

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