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Soliton configurations and ground states in maximal gauged supergravity

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We present new soliton solutions in a class of four-dimensional supergravity theories. For special values of the parameters, the solutions can be embedded in the gauged maximal N=8 theory and uplifted in the higher-dimensional D=11 theory. We also find BPS soliton configurations, preserving a certain fraction of supersymmetry.

Solitons play a special role in classical physics as well as in quantum and string theory, determining a richer structure of the full non-perturbative regime. This different class of exact solutions can be obtained from a double Wick rotation of a former black hole configuration, the new solutions characterizing a regular space-time configuration devoid of horizons. In non-supersymmetric AdS gravity, solitons play a fundamental role as they can be treated as ground states for suitable field theories. The negative mass of the AdS soliton has a natural interpretation as the Casimir energy of a gauge theory living on the conformal boundary. In a non-susy version of the AdS/CFT conjecture, this would indicate that the soliton is the lowest energy solution with the chosen boundary conditions, leading to a new kind of positive energy conjecture.

Finally, BPS gravitational solitons preserving a certain fraction of supersymmetry can be found, providing a privileged framework in studying the system evolution: the resulting dynamical equations are in fact typically first-order, as compared to the standard second order equations of motion.

Primary author(s) : Dr. GALLERATI, Antonio (Polytechnic of Turin)

Presenter(s) : Dr. GALLERATI, Antonio (Polytechnic of Turin)

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