Hyperconical universe and finite spacetime

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Abstract. Current problems like the `Hubble tension' and the `impossible early galaxies' reinforce the need for reviewing the standard cosmology. Under geometrical approaches, alternative cosmological models can be proposed by using spacetime obtained in a natural way. The most simple case is one based on intertial or linear expansion (hypercone), with spatial sections of positive, null or negative curvature k, where observer frames are comoving to the inertial expansion of the universe. A remarkable feature of the hyperconical model is that reference transformation leads to a radial inhomogeneity assimilable (i.e. projected) to an apparent acceleration, thus it predicts an apparent dark energy. For the particular case of k = 1, the hyperconical universe has a Ricci scalar curvature that locally is equivalent to a flat spacetime and dark energy is very close to the standard estimation (Monjo and Campoamor-Stursberg 2023). In fact, Hamiltonian equations showed that only k = 1 produces consistent dynamics (Monjo and Campoamor-Stursberg 2020). In other words, according to the symplectic geometry applied to Lorentzian manifolds, It is not possible to consistently build an infinite spacetime with finite time by keeping the basic principle of unprivileged places (e.g. Big Bang point). As a result, the model fits better to the observations than the standard model and it explains current problems such as the Hubble tension, dark energy origin, galaxy dynamics and evolution, among others (Monjo and Campoamor-Stursberg 2023, Monjo 2023). Therefore, from this natural manner of deriving a cosmology, it is deduced that spacetime is closed (finite). Under a physico-philosophical interpretation, the following can be set: *the finite light speed determines a finite space as time is finite too*.

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