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Sudden singularities in $f(R,T)$ gravity

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Might the universe, one day, undergo a Big Crunch, Big Freeze, Big Rip, or some other singularity? A “sudden singularity” occurs if the energy density, the scale factor and the Hubble function remain finite while there is a divergence in higher derivatives of the scale factor which could be accompanied by a pressure divergence. We investigate whether sudden singularities could arise in the $f(R,T)$ theory of modified gravity. We find that the conservation of matter can prevent sudden singularities in this theory. However, due to matter-geometry couplings, $f(R,T)$ gravity does not require matter conservation. Thus, we investigate a particular model where there is a sudden singularity in the third time derivative of the scale factor.

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