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Scalar field dark matter with time–varying equation of state

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We propose a new model of scalar field dark matter interacting with dark energy. Adopting a fluid description of the dark matter field in the regime of rapid oscillations, we find that the equation of state for dark matter is non-zero and even becomes increasingly negative at late times during dark energy domination. Furthermore, the speed of sound of dark matter is non-vanishing at all length scales, and a non-adiabatic pressure contribution arises.
The results indicate that there are still unexplored possible interactions within the dark sector that lead to novel background effects and can impact structure formation processes.

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