Readme: DGADGET-2

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This is an explainer file for DGADGET-2, a modification of the N-body simulation code GADGET-2 that includes parameterizations for a varying equation of state of dark energy.

Models DGADGET-2 gives the option of using one of four models of a time-varying equation of state. All four of these use two free parameters:

1. w_0: the current equation of state of dark energy.
2. w_1: the effective dw/dz in linear models of the equation of state, that models the deviation from a constant w_0.

[1] Linder (2003) : Linear in $a(t)$.

$$w(a) = w_0 + w_1(1-a)$$

[2] Jassal et. al. (2005): Quadratic in $a(t)$, accounts for rapid variation at late times.

$$w(a) = w_0 + w_1 a(1-a)$$

[3] Barboza and Alcaniz (2008): Bounded for all z.

$$w(a) = w_0 + \frac{w_1(1-a)}{a^2 + (1-a)^2}$$

[4] Wetterich (2004): Zero equation of state at high z.

$$w(a) = \frac{w_0}{[1 - w_1 \log a]^2}$$

Parameter File Options The parameter file uses three extra parameters (besides a normal GADGET-2 parameter file) to quantify the models:

1. `CurDEParam`: Current equation of state w_0.
2. `DEParamCoeff`: Parameter w_1.
3. `DEParamChoice`: Choice of parameterization. Setting to `0` corresponds to standard LCDM cosmology with $w = -1$. The choices `1` through `4` correspond to models [**1**] through [**4**] in order from above.

A sample parameter file is provided in the `parameterfiles` folder by the name of `lcdm_de.param`. The run parameters correspond to the initial conditions file `lcdm_gas_littleendian.dat` provided in the standard GADGET example ICs.

Compilation Compile as standard GADGET-2 is compiled.

References

[1] Linder, E. V. 2003, Phys. Rev. Lett., 90, 091301

[2] Jassal, H. K. Bagla, J. S., & Padmanabhan, T. 2005, MNRAS, 356, L11

[3] Barboza, E. M., & Alcaniz, J. S. 2008, Phys. Lett. B, 666, 415

[4] Wetterich, C. 2004, Phys. Lett. B, 594, 17