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Dynamic analysis of viscous material models. (English) [\[Zbl 07447618\]](#)

Chleboun, J. (ed.) et al., Programs and algorithms of numerical mathematics 20. Proceedings of the 20th seminar (PANM), Hejnice, Czech Republic, June 21–26, 2020. Prague: Czech Academy of Sciences, Institute of Mathematics. 139–148 (2021)

The authors present a nonlinear material model and compare the model response with an experiment. The model combines three sub-models. First, the viscoelastic prediction based on the standard linear solid (SLS) model (see [*I. Němec* et al., in: Programs and algorithms of numerical mathematics 19. Proceedings of the 19th seminar (PANM), Hejnice, Czech Republic, June 24–29, 2018. Prague: Academy of Sciences of the Czech Republic, Institute of Mathematics. 107–118 (2019; [Zbl 1463.74054](#))] is used. Second, a viscoplastic correction step is applied, see [*P. B. Lourenço* et al., *Int. J. Numer. Methods Eng.* 40, No. 21, 4033–4057 (1997; [Zbl 0897.73015](#))]. Finally, the viscodamage correction is employed, see [*J. Mazars* et al., “A new 3D damage model for concrete under monotonic, cyclic and dynamic loadings”, *Materials and Structures* 48, 3779–3793 (2015)].

In modeling the viscous behavior, the dynamic increase factor concept is used, namely the approach recommended in the CEB-FIP Model Code 1990 [Comité Euro-International du Béton. London: Thomas Telford House (1993)].

The model is verified by solving a series of simple benchmark problems and validated by comparing its response with the outcome of an experiment that measures the dynamic response of a reinforced concrete beam exposed to the impact of a punch in a drop weight tester. Numerical simulations are performed in the Dlubal RFEM system environment and the outputs illustrate the influence of the dynamic increase factor as well as of some parameters used in the visco-elastic model. The graphs show that a tuned model can qualitatively and even (to some extent) quantitatively capture the time course of the dynamic response of a beam.

For the entire collection see [[Zbl 1466.65003](#)].

Reviewer: [Jan Chleboun \(Praha\)](#)

MSC:

- [74H45](#) Vibrations in dynamical problems in solid mechanics
- [74C10](#) Small-strain, rate-dependent theories of plasticity (including theories of viscoplasticity)
- [74H15](#) Numerical approximation of solutions of dynamical problems in solid mechanics
- [74H05](#) Explicit solutions of dynamical problems in solid mechanics
- [74D05](#) Linear constitutive equations for materials with memory

Keywords:

[dynamic damping](#); [Rayleigh damping](#); [material viscosity](#); [vibration](#); [beam](#)

Software:

[RFEM](#)

Full Text: [DOI](#)