Banach J. Math. Anal. 4 (2010), no. 1, 100–115

Banach Journal of Mathematical Analysis
ISSN: 1735-8787 (electronic)
www.emis.de/journals/BJMA/

G-CONVERGENCE AND HOMOGENIZATION OF MONOTONE DAMPED HYPERBOLIC EQUATIONS

GABRIEL NGUETSENG[1], HUBERT NNANG[2] AND NILS SVANSTEDT[3]*

Dedicated to Professor Lars-Erik Persson on the occasion of his 65th anniversary

Communicated by P. Wall

Abstract. Multiscale stochastic homogenization is studied for quasilinear hyperbolic problems. We consider the asymptotic behaviour of a sequence of realizations of the form $\frac{\partial^2 u_\varepsilon^\omega}{\partial t^2} - \operatorname{div}\left(a\left(T_1(\frac{x}{\varepsilon_1})\omega_1, T_2(\frac{x}{\varepsilon_2})\omega_2, t, Du_\varepsilon^\omega\right)\right) - \Delta(\frac{\partial u_\varepsilon^\omega}{\partial t}) + G\left(T_3(\frac{x}{\varepsilon_3})\omega_3, t, \frac{\partial u_\varepsilon^\omega}{\partial t}\right) = f$. It is shown, under certain structure assumptions on the random maps $a(\omega_1, \omega_2, t, \xi)$ and $G(\omega_3, t, \eta)$, that the sequence $\{u_\epsilon^\omega\}$ of solutions converges weakly in $L^p(0,T;W_0^{1,p}(\Omega))$ to the solution u of the homogenized problem $\frac{\partial^2 u}{\partial t^2} - \operatorname{div}(b(t, Du)) - \Delta(\frac{\partial u}{\partial t}) + \overline{G}(t, \frac{\partial u}{\partial t}) = f$.

[1] Department of Mathematics, Faculty of Sciences, University of Yaounde I, P.O. Box 812, Yaounde, Cameroon.
E-mail address: nguetseng@uy1.uninet.cm

[2] Department of Mathematics, Ecole Normale Supérieure, University of Yaounde I, P.O. Box 47, Yaounde, Cameroon.
E-mail address: hnnang@yahoo.fr

[3] Department of Mathematical Sciences, University of Gothenburg, SE-412 96 Gothenburg, Sweden.
E-mail address: nilss@chalmers.se

Date: Received: 21 September 2009; Revised: 26 January 2010; Accepted: 12 February 2010.
* Corresponding author.
2000 *Mathematics Subject Classification.* Primary 35B27; Secondary 35B40.
Key words and phrases. G-convergence, multiscale, stochastic, homogenization, elliptic, parabolic, hyperbolic.