Exponential rate of convergence for the solution of elliptic problems in strips

Michel Chipot
Angewandte Mathematik
Universität Zürich
Winterthurerstr. 190
CH-8057 Zürich, Switzerland
E-mail: m.m.chipot@math.unizh.ch

We would like to present some results regarding the exponential rate of convergence of the solution of problems set in cylinders $\Omega_\ell = (-\ell, \ell)^p \times \omega$ when ℓ goes to ∞. As a model problem consider

$$-\Delta u_\ell = f = f(x_2) \text{ in } \Omega_\ell = (-\ell, \ell) \times \omega \quad , \quad u_\ell = 0 \text{ on } \partial\Omega_\ell,$$

where ω is an interval, then one has for some constants C, C'

$$||u_\ell - u_\infty||_{H^1(\Omega_{\frac{\ell}{2}})} \leq C exp(-C'\ell)$$

where u_∞ is the solution to

$$-\partial^2_{x_2} u_\infty = f \text{ in } \omega \quad , \quad u_\infty = 0 \text{ on } \partial\omega.$$