Identification of conductivity
by minimising a gradient co-linearity mismatch norm

Giovanni F Crosta
Milan, IT: 2015 Jan 12

Kurzfaßung

Let $\Omega \subset I\!R^2$ be bounded by two heteroclinic orbits, Γ_1, Γ_2 of the ∇u-flow. Then $\nabla \cdot (c\nabla u) = 0$ in Ω implies $c \equiv 0$ in $\bar{\Omega}$ [Chicone and Gerlach, 1987]. Let $u \in \mathcal{C}^2(\Omega) \cap \mathcal{C}^0(\bar{\Omega})$ be known. The (unique) conductivity $\hat{a}$, which complies with $\nabla \cdot (\hat{a}\nabla u) = f$, can be identified by minimising with respect to b the norm of $\nabla\tilde{a}[b] \times \nabla u - \nabla b \times \nabla p$ under constraints, where $\nabla \cdot (b\nabla p) = f$ and $\tilde{a}[b]\partial_j u := b\partial_j p$, $j = 1$ **or** 2. This is an attempt at justifying the "comparison model" algorithm [Scarascia and Ponzini, 1972], which has seen successful practical applications to inverse hydrogeology ever since.

Giovanni F Crosta