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Minimization of fractional seminars on the real line and applications to misfit dislocations

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We prove that minimizers of fractional Gagliardo seminorms, among piecewise affine functions defined on the real line with two given - opposite - slopes (suitably prescribing the length scale of the oscillations) are periodic.
We extend such a result to a less rigid setting that allows to study also the gradient flow of the energy functionals.
Our analysis applies to the van der Merwe theory of misfit dislocations. We consider two elastic materials casting parallel lattices having different but very close spacing (semi-coherent interface). Identifying (small) intervals with negative derivative with the core regions of dislocations lying on semi-coherent interfaces, and describing the elastic energy on the half-planes delimited by such interface as the Gagliardo seminorm of the boundary datum, our analysis proves that the minimal energy is obtained when the dislocations are uniformly distributed.

Joint work with M. Goldman, M. Ponsiglione, E. Spadaro.

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