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Radial Fourier multipliers and a local smoothing inequality

We shall discuss recent work on two problems on radial FL^p multipliers, for suitable $p < 2$, and give some partial answers.

Consider the convolution operator T_m defined via the Fourier transform by

$$\widehat{T_m f}(\xi) = m(|\xi|)\widehat{f}(\xi).$$

I. Can one characterize those m for which $\|T_m f\|_p \lesssim \|f\|_p$ holds for all *radial* functions in $L^p(\mathbb{R}^d)$?

The results are joint work with **G. Garrigós**.

II. Can one characterize those m for which $\|T_m f\|_p \lesssim \|f\|_p$ holds for *all* functions in $L^p(\mathbb{R}^d)$?

Related to this question is the local smoothing problem for the wave equation as formulated by Sogge: Does the inequality

$$\Big(\int_0^1 \|e^{it\sqrt{-\Delta}} f\|_q^q \, dt\Big)^{1/q} \lesssim \|f\|_{L^q_\beta}$$

hold for $\beta = (d-1)(1/2 - 1/q) - 1/q$, for suitable $q \gg 2$? Here L^q_β is the usual Sobolev space.

The results are joint work with **F. Nazarov**.