

Abstract Submitted  
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**The spectral link for frictional drag in non-uniform turbulent soap-film flows**<sup>1</sup> CHIEN-CHIA LIU, Okinawa Institute of Science and Technology, RORY CERBUS, WALTER GOLDBURG, University of Pittsburgh, GUSTAVO GIOIA, PINAKI CHAKRABORTY, Okinawa Institute of Science and Technology — The spectral link provides a novel relation between the frictional drag ( $f$ ) and the exponent  $\alpha$  of the turbulent energy spectrum ( $E(k) \sim k^{-\alpha}$ ):  $f \sim \text{Re}^{(1-\alpha)/(1+\alpha)}$ , where  $\text{Re}$  is the Reynolds number. The spectral link has been verified experimentally in uniform turbulent soap-film flows where the same  $\alpha$ , which is either 3 (the enstrophy cascade) or 5/3 (the inverse energy cascade), prevails across the width of the flow. We perform experiments on non-uniform turbulent soap-film flows where  $\alpha$  switches between 3 and 5/3 across the width of the flow. Our measurements of  $f$  vs.  $\text{Re}$  are in excellent accord with the localized version of the spectral link.

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Pinaki Chakraborty  
Okinawa Institute of Science and Technology

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