Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Effect of wind-induced drag on leaf shapes JEAN-FRANCOIS LOUF, Virginia Tech, PIERRE NTOH SONG, Polytech'Marseille, TIM ZEHNBAUER, SUNGHWAN JUNG, Virginia tech — Under windy conditions everyone can see leaves bending and twisting. From a geometrical point of view, a leaf is composed of two parts: a large flat plate called the lamina, and a small beam called the petiole, connecting the lamina to the branch/stem. While the wind is exerting forces (e.g. drag) on the lamina, the petiole undergoes twisting and bending stresses. To survive in harsh abiotic conditions, leaves might have evolved to form in many different shapes, resulting from a coupling between the lamina and the petiole. In this study we measure the twisting modulus (G) of the petiole using a twisting setup, and its Young modulus (E) by performing tensile tests. Micro-CT scan is used to precisely measure the cross section of the petiole allowing us to calculate the second moment of inertia (I) and the second moment of area (J). We then use the non-dimensional number EI/GJ and compare it to a geometrical non-dimensional number (Lpetiole+Llamina/2)/W, where Lpetiole is the length of the petiole, Llamina the length of the lamina, and W the width of the lamina. We found a linear relation between the ratio of the bending to twisting rigidity and the leaf geometry.

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Date submitted: 02 Aug 2016 Electronic form version 1.4