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Universality of osmotically driven sap-flow in plants TOMAS BOHR, KÅRE HARTVIG JENSEN, KIRSTINE BERG SØRENSEN, SØREN MØRCH FRIIS, Center for Fluid Dynamics, Department of Physics, Technical University of Denmark, JOHANNES LIESCHE, ALEXANDER SCHULZ, Department of Plant Biology and Biotechnology, University of Copenhagen — Since Ernst Münch in the 1920s proposed that sugar transport in the phloem vascular system of plants is driven by passive osmotic pressure gradients, it has been strongly debated whether this hypothesis can account even for long distance translocation. Recently, it was shown that theoretical optimization of the Münch mechanism leads to surprisingly simple predictions for the dimensions of the phloem sieve elements in relation to those of the plants [Jensen et. al., J. Roy. Soc. Interface **8**, pp. 1155–1165 (2011)]. We show that the theoretical results are very insensitive to the details of the sugar-loading (in leaves) and unloading (in shoots or roots) and can even be obtained from a simple coupled resistor model. We have compiled anatomical data for a wide group of plants and find good agreement with theory, even for conifer trees, in which the sugar translocation is substantially slower than hardwood trees.

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