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Direct numerical simulation of flow past cactus–shaped cylinders

PRADEEP BABU, KRISHNAN MAHESH, University of Minnesota — The Saguaro cacti are tall, have short root systems and can withstand high wind velocities (Bulk 1984, Talley et al. 2002). Their trunks are essentially cylindrical with V–shaped longitudinal cavities. The size and number of cavities on the Saguaro cacti vary so that they have a near–constant fraction cavity depth (l/D ratio of about 0.07, Geller & Nobel 1984). Direct numerical simulations is used to assess the aerodynamic effect of the grooves on the cactus. DNS is performed for cactus shaped cylinders with l/d ratio's of 0.07 and 0.105, and smooth cylinders (l/d=0) at the same Reynolds number. Presence of the V–shaped cavities is found to decrease the drag on the cylindrical trunk as well as affect the fluctuating lift forces. The talk will quantify these differences, and discuss the physical mechanisms by which V–shaped cavities on the surface influence the flow.

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