

Abstract Submitted  
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**A Symmetric breaking hysteresis in a plane wake** GUIREN WANG,  
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nology — We have observed a new phenomenon called symmetric breaking hystere-  
sis. The flow is a confined plane wake in a pipe, i.e. the inlet of the pipe is a plane  
wake with adjustable initial mean flow velocity  $U_1$  and  $U_2$  respectively on each side  
of the splitter plate. When the forcing level is sufficiently high at low frequency,  
the wake becomes asymmetric to the trailing edge. Randomly one side has much  
higher turbulence than the other. When  $U_1$  is at the side with lower turbulence and  
is gradually increased up to a critical value (thus the flow is no more a wake, but  
mixing layer), there is a sudden switch of the asymmetric flow: the side with lower  
turbulence and higher mean velocity now has higher turbulence than the other side  
(i.e.  $U_2$ ). If  $U_1$  is now reduced to the same value as  $U_2$ , no change in the flow  
can be observed. However, when  $U_1$  is reduced to a critical value lower than  $U_2$ ,  
the asymmetric flow suddenly switches again. In the whole process, no symmetric  
wake can be observed. This phenomenon of symmetric breaking hysteresis becomes  
weaker with the increase of the Reynolds number of the wake. Quantitative scalar  
measurement confirmed the visualization.

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