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A unique constellation of spacecraft constellations to study KHI in 2017-2020: MMS, Cluster and Themis

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Over more than 10 years, the Cluster and the Themis missions have shed a total new light on the Kelvin-Helmholtz Instability mechanism. To name a few, these missions have enabled the observation of KHI rolled-up vortices for the first with four spacecraft (Hasegawa et al., 2004). They revealed its presence under any IMF conditions (Hwang et al., 2011, 2012), previously underestimated (Kavosi and Raeder, 2015). Very recently, the presence of ion magnetosonic waves with sufficient energy to account for the observed level of ion heating within a KHI vortex may be evidence of cross-scale energy transport (Moore et al., 2016).
After presenting some the main highlights of Cluster and Themis on this phenomenon, we will present upcoming new observations with MMS, Cluster and Themis foreseen in 2017-2020 timeframe. Together, they will form a unique constellation of spacecraft constellation to study this phenomenon for the first time.
Now looking forward: how to go from a qualitative picture to a quantitative picture of this phenomenon? For instance, how to quantify the role of KHI in the formation of the cold dense plasmasheet? Which observations would be then needed? Two main concepts of new observations will be evoked.