Modulated point vortex couples on a beta-plane: dynamics and chaotic advection[1] IZABELLA BENCZIK, Virginia Tech, TAMAS TEL, ZOLTAN KOLLO, Eotvos University Budapest — The dynamics of modulated point vortex couples on a beta-plane is investigated for arbitrary ratios of the vortex strength. The motion is analysed in terms of an angle and a location dependent potential and the structural changes in their shape. The location dependent potential is best suited for understanding different types vortex orbits. It is shown to be two-valued in a range of parameters, a feature which leads to the appearance of orbits with spikes, in spite of the integrability of the problem. The advection dynamics in this modulated two-vortex problem is chaotic. We point out a transition from closed to open chaotic advection implying that the transport properties of the flow might drastically be altered by changing some parameters or the initial conditions. The open case, characterized by a permanent entrainment and detrainement of particles around the vortices, is interpreted in terms of an invariant chaotic saddle of the Lagrangian dynamics, while the dynamics of the closed case, with a permanently trapped area of the fluid, is governed by a chaotic region and interwoven KAM tori.

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