Overhead view (flow from left to right) of gridfree vortex tube elements used in a numerical simulation of a transitioning boundary layer. Transition is marked by the appearance of elongated streamwise-oriented vortex furrows overlaying low speed streaks.

At their upstream end, furrows are formed of forward-tilted arch-like vortices (shown in black on 3 cuts through the furrow) whose associated counter-rotating motion takes the form of "hairpin legs" when isosurfaces of rotational motion are displayed (shown in green).

In the central part of the furrows, the vortex filaments have the appearance of mushrooms whose lobes contain streamwise-oriented vorticity (shown in blue or red for the + or - streamwise direction, respectively). "Hairpin legs" passing through the lobes of the mushrooms mark the rotational motion produced by the furrow.

When a furrow is tilted to one side, streamwise vorticity collects in only the lobe closest to the ground and the associated rotational motion has the character of an asymmetric hairpin with a single "leg".

At the end of transition the mushrooms breakdown into complex vortical structures. In this example, roll-up of spanwise vorticity on the outer surface of a highly tilted furrow creates the illusion of a "hairpin packet" when isosurfaces of rotational motion are displayed.

When tracers are used to imitate the effect of releasing smoke into the boundary layer, the furrows become visible in the form of "pockets."