Eulerian and Lagrangian time-mean processes are most frequently applied methods in the physical oceanography research, either in cruise observation or in model simulation. In this study, single-frequency tide induced residual current with inter-tidal concentration of conservative substance is simulated by a 3-D hydrodynamic model HAMSOM with trajectory tracking sub-model. Three semi-closed estuary models are constructed for different topography or coastline, named as isobathic model, stair model, and cape model. Firstly, the difference between Eulerian residual current (ERC) and Lagrangian residual current (LRC) is studied in three cases. It is shown that magnitudes of LRC and ERC are in the same order. However, the current fields take on significant differences, such as only outflow in ERC, while both outflow and inflow in LRC, presenting water imbalance in ERC field. And then dependence of LRC, also the inter-tidal concentration of conserved substance, on releasing time is studied in each case. It is found that the nonlinearities of stair and cape model are stronger than that of isobathic model for a set of infinite temporal-spatial fields of current/concentration is exhibited as the releasing time (i.e. the tidal phase) varies continuously over one tidal cycle, each of which corresponds to a specific value of tidal phases. While the convectively weakly nonlinear condition is still satisfied in the isobathic model, so its set of infinite temporal-spatial fields of current/concentration could be reduced to a single value as shown traditionally, i.e. mass-transport velocity/ Eulerian tidally-mean concentration.