Duality for coalescing stochastic flows on $\mathbb{R}$

Given a stochastic flow $\{\psi_{s,t}\}_{s\le t}$ on $\mathbb{R}$ which is continuous in time variable t, a dual flow is defined as a flow $\{\tilde{\psi}_{t,s}\}_{s\le t}$ with reversed time such that trajectories of ψ and $\tilde{\psi}$ never cross each other. For stochastic flow of homeomorphisms the dual flow is the inverse flow, $\tilde{\psi}_{t,s} = \psi_{s,t}^{-1}$. For a coalescing stochastic flow the structure of a dual flow is more subtle, e.g. for the Arratia flow the dual flow is again the Arratia flow that moves backwards in time and passes exactly through the points of spatial discontinuity of a forward flow. This duality has a number of consequences for various point processes related to the Arratia flow, geometry of clusters and the construction of a Brownian web.

In the talk we will prove existence of dual flows for a class of coalescing stochastic flows on $\mathbb{R}$. In fact, a pair of a flow and its dual will be constructed as a pair of a forward and a backward perfect cocycles over the same metric dynamical system. As an application we will describe the geometry of an unbounded cluster in a coalescing stochastic flow with a stationary point.