



Contribution ID: 336

Type: **Oral presentation**

## Causal evolution of probability measures

*Thursday, July 5, 2018 3:20 PM (20 minutes)*

The causal structure of a spacetime  $\mathcal{M}$  is usually described in terms of a binary relation  $\preceq$  between events called the causal precedence relation (often referred to as  $J^+$ ). In my talk I will present a natural extension of  $\preceq$  onto the space  $P(\mathcal{M})$  of (Borel) probability measures on  $\mathcal{M}$ , designed to rigorously encapsulate the common intuition that probability can only flow along future-directed causal curves.

Using the tools of the optimal transport theory adapted to the Lorentzian setting, one can utilize thus obtained notion of ‘causality between measures’ to model a causal time-evolution of a spatially distributed physical entity in a globally hyperbolic spacetime. I will define what it means that a time-dependent probability measure  $\mu_t \in P(\mathcal{M})$  evolves causally. I will discuss how such an evolution can be understood as a ‘probability measure on the space of worldlines’. I will also briefly present some preliminary results concerning the relationship between the causal time-evolution of measures and the continuity equation.

**Primary author:** MILLER, Tomasz (Warsaw University of Technology)

**Presenter:** MILLER, Tomasz (Warsaw University of Technology)

**Session Classification:** Special session on Astro-Cosmo-Gravity