Department of Mathematics and Computer Science
@ St.Petersburg State University

COLLOQUIUM

Thursday, November 25, 18:15

Zoom 958-115-833, room 104 (14th line V.O., 29)

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The propagation of reaction-diffusion fronts driven by a line of fast diffusion

It has long been known that fast diffusion on roads can have a driving effect on the spread of biological invasions. One of the most recent, and best documented examples, is the spread of covid-19 in Northern Italy: its well developed motorway system played an important role in the enhancement of the spread of the epidemics. It has been observed that invasive insects, such as the Processionary caterpillar of the pine tree in Europe, or the tiger mosquito, have been moving nortwards faster than anticipated. One plausible explanation is that enough individuals might have been carried on further distances than usual by vehicles travelling on roads going through infested areas.

The goal of the talk is to present a stylised reaction-diffusion model, proposed in a collaboration with H. Berestycki and L. Rossi, to account for these situations. A single species moves in a two-dimensional half plane bounded by a line on which fast diffusion takes place. Reproduction and usual diffusion only occur outside this line, and the line exchanges individuals with the half-plane through a Robin type boundary condition.

I will explain how the line influences the overall front propagation in this setting, sharply contrasting with the existing results. Some ramifications, such as the influence of a nonlocal diffusion on the line, or the propagation of epidemics, will also be discussed.

Everyone is welcome!