Scientific report

As it was described in the research program, the aim of my visit to Potsdam was to study (in collaboration with Paolo Dai Prá and Pierre-Yves Louis) the monotonicity problem for continuous-time Markov Chains, i.e., to give a description of those (finite) partially ordered state spaces for which there is not equivalence between the concepts of "stochastic monotonicity" and "realizable monotonicity". For a discrete-time Markov Chain, we know that monotonicity equivalence does not hold if and only if the poset is *non-acyclic*, but this condition is not sufficient in continuous time: we found many examples of non-acyclic posets for which we have monotonicity equivalence and non-acyclic posets for which we have not equivalence. In particular, for posets with less than seven points we were able to determine all the posets for which equivalence fails. We used this fact to prove that in each poset containing one of the former as subposet, monotonicity equivalence fails as well. Moreover, we found other sufficient conditions on the structure of a general state space for the existence of monotone Markov chains which are not realizably monotone.

We found also sufficient conditions for monotonicity equivalence on non-acyclic posets. Part of these results were collected in the short note: P. Dai Pra, P.Y. Louis, I. Minelli, *The monotonicity equivalence for continuous-time Markov chains* (accepted in Comptes Rendus Acad. Science, Paris.). A more detailed paper is in preparation.