**Abstract for the special session “Urban scaling and data challenges” in international conference *"Challenges in Data Science: a Complex Systems Perspective 2023”***

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**Title: How scaling laws challenge geographical theories of urban systems**

**Abstract:**

Since some twenty years the literature on scaling laws is booming, especially regarding their applications to urban systems. Is this a real breakthrough in the understanding of urban dynamics, or just a passing fad for a new scientific fashion? What are the results of this research trend? Can we draw interesting directions from it to deepen theoretical knowledge and to improve urban policies? I will answer these questions by recalling the conditions in which the first work on scaling laws applied to cities emerged, between our Parisian team of geographers and those of the Santa Fe Institute and London Imperial College. I will then show how the conception of these scaling laws evolved as they were confronted with a variety of empirical data and a diversity of systems of cities. By comparing the results obtained with those of other modelling approaches, I will make a provisional assessment of the contribution of this work to the evolution of urban theories. Some basic principles explain the recurrent difficulty of transferring and integrating models between the natural and social sciences. These issues need to be widely discussed in order to avoid too risky interventions in the dynamics of complex systems before new models can be proposed to planners.

**Keywords**: Systems of cities; rank-size rule; urban dynamics; co-evolution; urban theories