Patches, ducks, and kaleidoscopes: a comparative study of spatial patterns in the problem of biological invasion

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Biological invasion of alien species is regarded as one of the major threats to ecosystems all around the world and understanding of spatio-temporal patterns arising in invasive species spread is necessary for successful management and control of harmful species. Various growth-dispersal-type models of population dynamics predict that invasive species spread can follow two qualitatively different scenarios such as the propagation of a continuous population front and the 'no-front' patchy invasion. Distinguishing between those two patterns of spread is important, in particular because the patchy invasion poses a much greater challenge for monitoring and control.

We introduce several topological quantities that can be used for classification of spatial patterns of biological invasion [1]. It will be demonstrated in our talk how the topological characteristics allow one to distinguish between spatial patterns of patchy invasion and continuous front propagation. We also investigate reliability of the topological characteristics in computational 'duck tests' when they are applied to similarly looking spatial patterns where continuous front propagation can be easily confused with patchy invasion.

References

[1] N.B. Petrovskaya and W. Zhang, *Accurate recognition of spatial patterns arising in spatio-temporal dynamics of invasive species.* in: L. Formaggia (ed.), Dynamical Systems Applied to Biology and Natural Sciences, SEMA-SIMAI Springer Series, Springer, Berlin, 2019 (accepted for publication)

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