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Mitigating Urban Heat Island Intensity in Urban Environments by optimal control method

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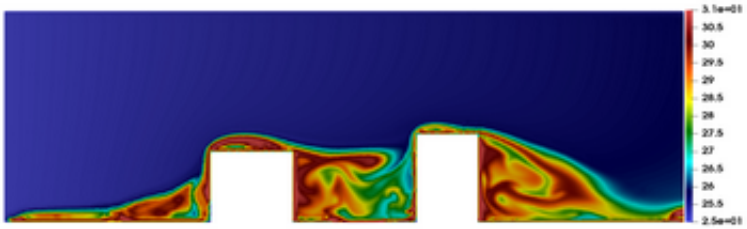
Climate in urban areas differs from that in neighboring rural areas, as a result of urban development. It can create issues. Among these disturbances, Urban Heat Island (UHI) is a huge risk with many negative consequences (health, comfort...). It concerns urbanized area where temperatures are higher than in surrounding areas. To reduce this effect, the implantation (and design) of green spaces in dense cities is a pertinent solution.

In this study, we use optimal control method to find the optimal shape of green space. We consider city as a porous media system. Therefore, a three-dimensional model is established for numerical studies of the effects of urban anthropogenic heat and wind velocity in urban and rural regions. The transport mechanism of fluid in the cities is governed by the Navier–Stokes–Forchheimer porous media system. It is actually based on non-stationary turbulent fluid dynamics coupled with heat equation considering building/soil radiation effects.

We compute two-dimensional direct numerical simulation. We show the results for temperature and velocity fields. This work presents the governing equations, the control optimal algorithm and discusses the results of the predictions of the flow problems constituting the initial validation space of the model.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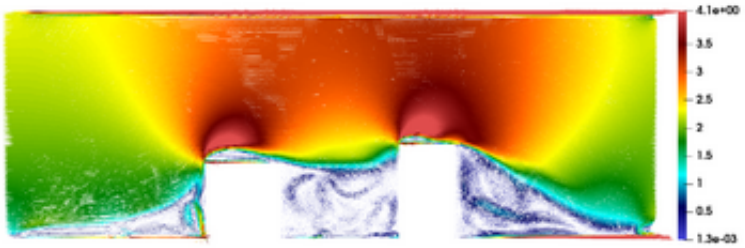
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