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RubberCity project

TIRE AND ROAD WEAR PARTICLES IN URBAN ENVIRONMENTS: EMISSIONS, TRANSFER AND IMPREGNATION OF URBAN SOILS

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Introduction

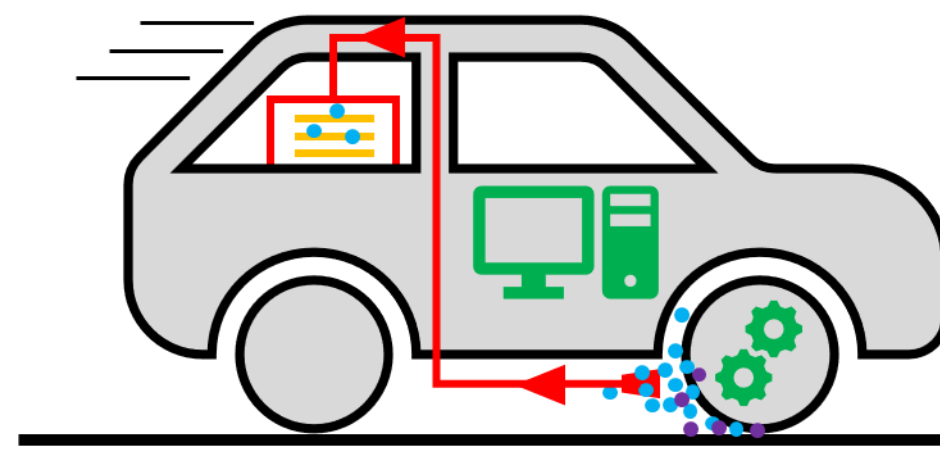
Tire and Road Wear Particles (TRWP) are continuously being emitted by traffic. The emission of TRWP, along with their transfer to the atmosphere followed by their transport via runoff into the environment, has led in the long-lasting contamination of soils, especially in urban areas.

The RubberCity project (2024-2026) is a fundamental research initiative aimed at providing new scientific knowledge on both the emissions and impregnation of urban environments by TRWP.

Objectives

The RubberCity project has two main objectives for an integrated approach.

- Analyzing the sources by assessing realistic emissions of TRWP using instrumented vehicles and determining the influencing factors (speed, acceleration, braking, etc.)
- Studying targets by quantifying TRWP in urban environments, specifically in the atmosphere, road dust, soils, and urban parks near roadways in the city of Nantes (France).



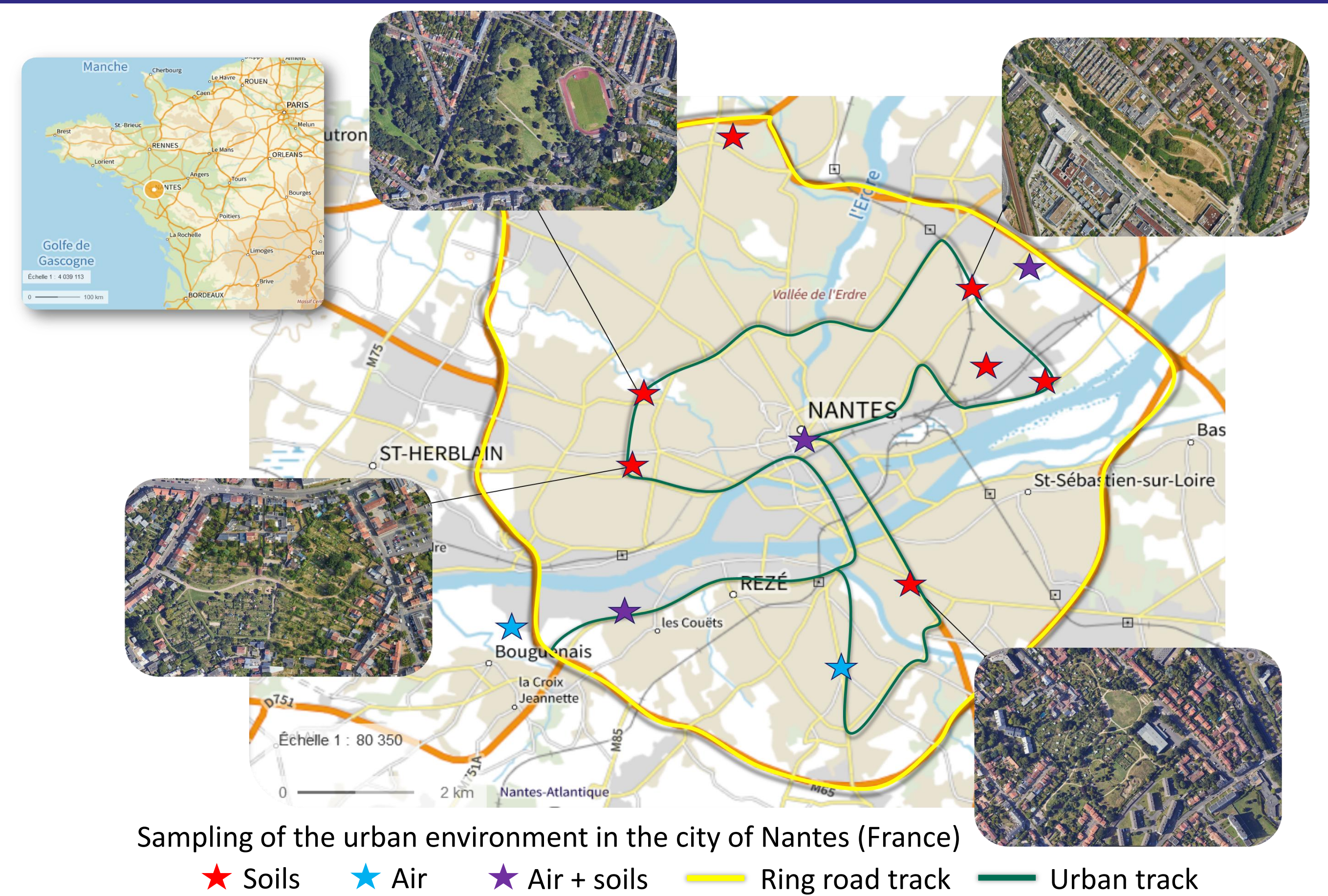
Integrated approach targeting emissions and air – soils contamination

Emissions

Emissions of TRWP assessed using two vehicles, one thermal and, for the first time, **one electric, under real traffic conditions** (ring road, urban tracks – 80 km). The high-volume sampler (HVS) collects particles on filters across seven size fractions ranging from 0.39 to 10 μm .

Air

Atmospheric deposition and concentration of TRWP assessed using a passive sampler for microplastics over one month (a) and an active sampler (Leckel-LVS6) with quartz fiber filter (QM-A) over one week (b).



Soils

TRWP impregnation of urban soil was assessed by **sampling roadside areas following distances from the road (up to 20 m, top 5 cm) and soil depths (up to 30 cm), as well as in urban parks.**

Analytical and preparation protocol

The analysis were performed by the means of pyrolysis coupled with gas chromatography-mass spectrometry. The quantification is based on the 4-phenylcyclohexene marker of styrene-butadiene-rubber (SBR) ($m/z = 104$) and using an internal deuterated standard d-SBR.

Filters from the HVS are dried in a desiccator, and approximately 15 to 20 mg is weighed into the cups for analysis.

(c) Samples are filtered on quartz fiber filter ($\pm 1\text{L}$) and dried in a desiccator. 15 to 20 mg is weighed into the cups for analysis. (d) QM-A are dried in a desiccator. 15 to 20 mg is weighed into the cups for analysis.

Soil samples are dried at 105°C for 24 hours, ground, then digested with KOH at 60°C for 24 hours, followed by filtration through a 1 μm PTFE filter. 3 to 5 mg of the resulting "cake" is weighed into the cups for analysis.

Preliminary results

All soil samples from parks were **< LOQ (at 25 μg SBR/g of dried sample)**, consistent with TRWP propagation mainly via runoff, and the limiting effect of dense vegetation, trees, walls, and buildings surrounding parks on airborne contamination, even in dense urban areas.

The RubberCity project will provide estimates of emissions, air deposition and soils contamination for Nantes city, offering insights into TRWP's impact on the urban environment and supporting public policy to reduce emissions and manage contamination.