Air-generated noise sources during the closure of a tire's groove.

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ABSTRACT

Traffic noise is an increasing concern for the population all over the world and the noise generated by the road/tire interaction is considered today as the dominant one for passenger cars above 40\ km/h. With the vibration-born sound, the aerodynamic related noise is one of the most important generating mechanisms. This work sights a better understanding and modelling of the air-related tire noise with focus on the air-pumping effect.

Gagen demonstrated the importance of the air properties in a squeezing process and that a monopole theory cannot describes it because of nonlinear effects. Pursuing the research of Kim and al., a local CFD simulation of a closure of a tire groove is carried to understand how the air displacements at the groove scale are impacted by the closure and can generate noise. A hybrid method based on Lighthill's acoustic analogy is performed to compute near-field noise. A comparison with a full DNS simulation is made to evaluate the viability of this multi-scale approach.

Conclusion on the possibility to identify locally the noise sources and the importance of the nonlinear effects will be drawn. We want to understand why the knowledge of the structure deformation at the contact patch (in particular the cavity volume changes) are not sufficient to compute the aerodynamic noise sources and how the air displacements (for example vortices) impact the noise generation process.

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