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Toward the optimization of the ballast gluing process for track resistance lateral enhancement

Félix LABOUP$^{1,2}$, Mathieu RENOUF$^1$, Jean-François FERELLEC$^2$, Michel WONE$^2$

1 LMGC, UM, CNRS, Montpellier, France, 2 SNCF Réseau, Saint-Denis, France

Main conclusions:
- Number of glued grains decrease with depth
- Volume of glued contact independent of its position

Ballast functions
- Normal load transmission
- Vibration damping

Main risks
- Ballast light
- Ballast displacement

Consequences
- Loss of track properties with ballast displacement
- A costly maintenance

Microscopic scale (grain)
- Characterization of glued contact in traction
- Grain surfaces conserved
- Controlled contact typology (point/face, edge/face
- and face/face contacts)
- Minimum of 15 repetitions

Interaction law A Maugis-Dugdale model
- Tensile strength depends on adhesive surface contact
- Contact topology influences tensile strength
- Displacement at maximum tensile strength independent of glued surface

Mesoscopic scale (REV)
- Glue repartition? Glue bound volume?

Gluing experiment:
- Box dimension: 40x60x60 cm
- Ballast density: 1543 kg.m$^{-3}$
- Glue quantity: 1,25 L.m$^{-2}$

Main conclusions:
- Number of glued grains decrease with depth
- Volume of glued contact independent of its position

Macroscopic scale (Railway section)
- Lateral resistance tests

Main conclusions:
- Numerical model requires adjustments
- Similar tendencies

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Experimental Part

Numerical Part

Gluing Configurations

Gluing Configurations

Gluing experiment:
- Box dimension: 40x60x60 cm
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