IMPACT OF CLIMATE CHANGE ON RUTTING

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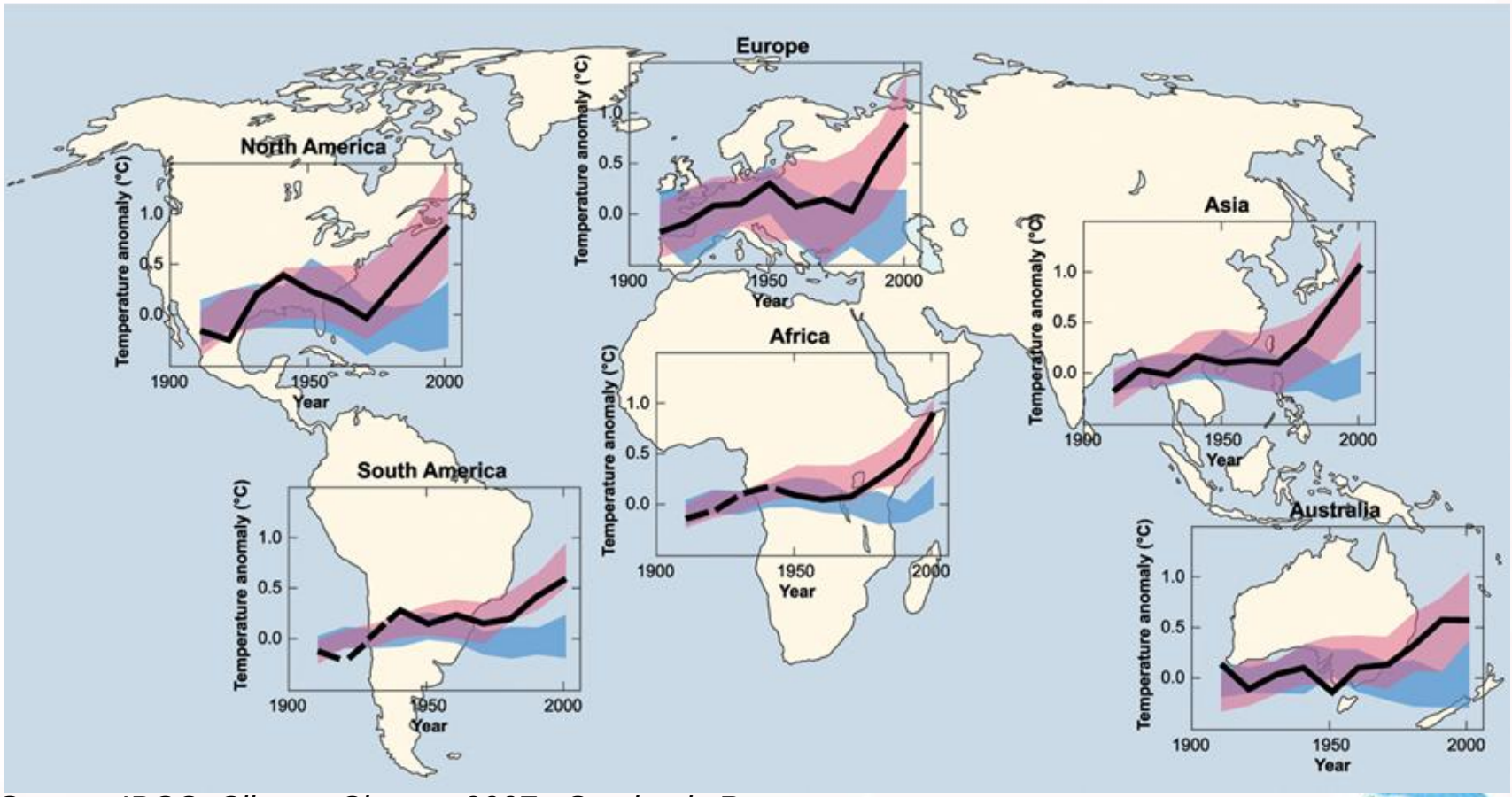
TECHNISCHE UNIVERSITÄT DRESDEN

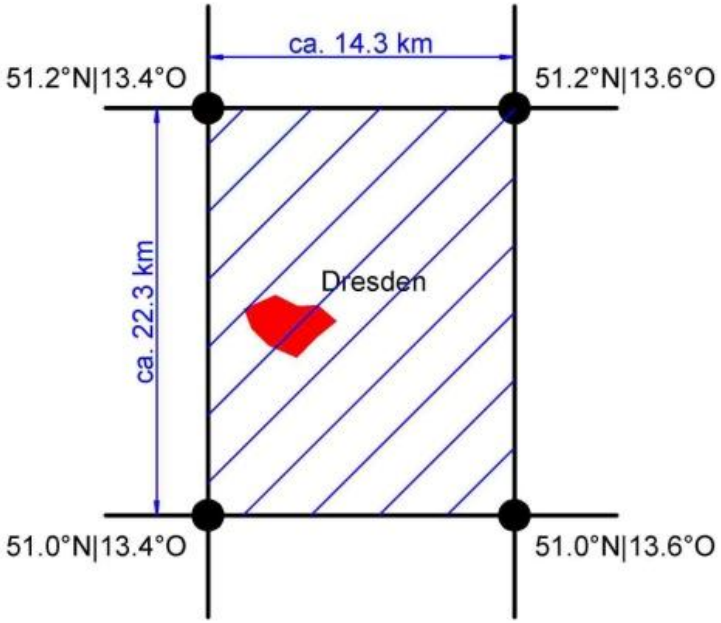
StB

Climate-related changes



Source: IPCC: Climate Change 2007 - Synthesis Report.

Thermal prediction simulations for asphalt pavements



IPCC Emission Scenario **A1B**

variant-ID	VAR1	VAR2	VAR3
parameters for asphalt			
reflectance (short-wave solar radiation) [-]	0.800	0.850	0.900
reflectance (long-wave terrestrial radiation) [-]	0.975	0.950	0.925
thermal conductivity [W/m/K]	1.25	1.05	0.75
specific heat capacity [Ws/kg/K]	1,000	878	650
density [kg/m³]	2,500	2,240	2,000
conductibility of temperature [cm²/h]	18.00	19.22	20.77
parameters for sub base			
conductibility of temperature [cm²/h]	42.68	42.68	42.68
parameters for sub grade			
conductibility of temperature [cm²/h]	46.54	46.54	46.54

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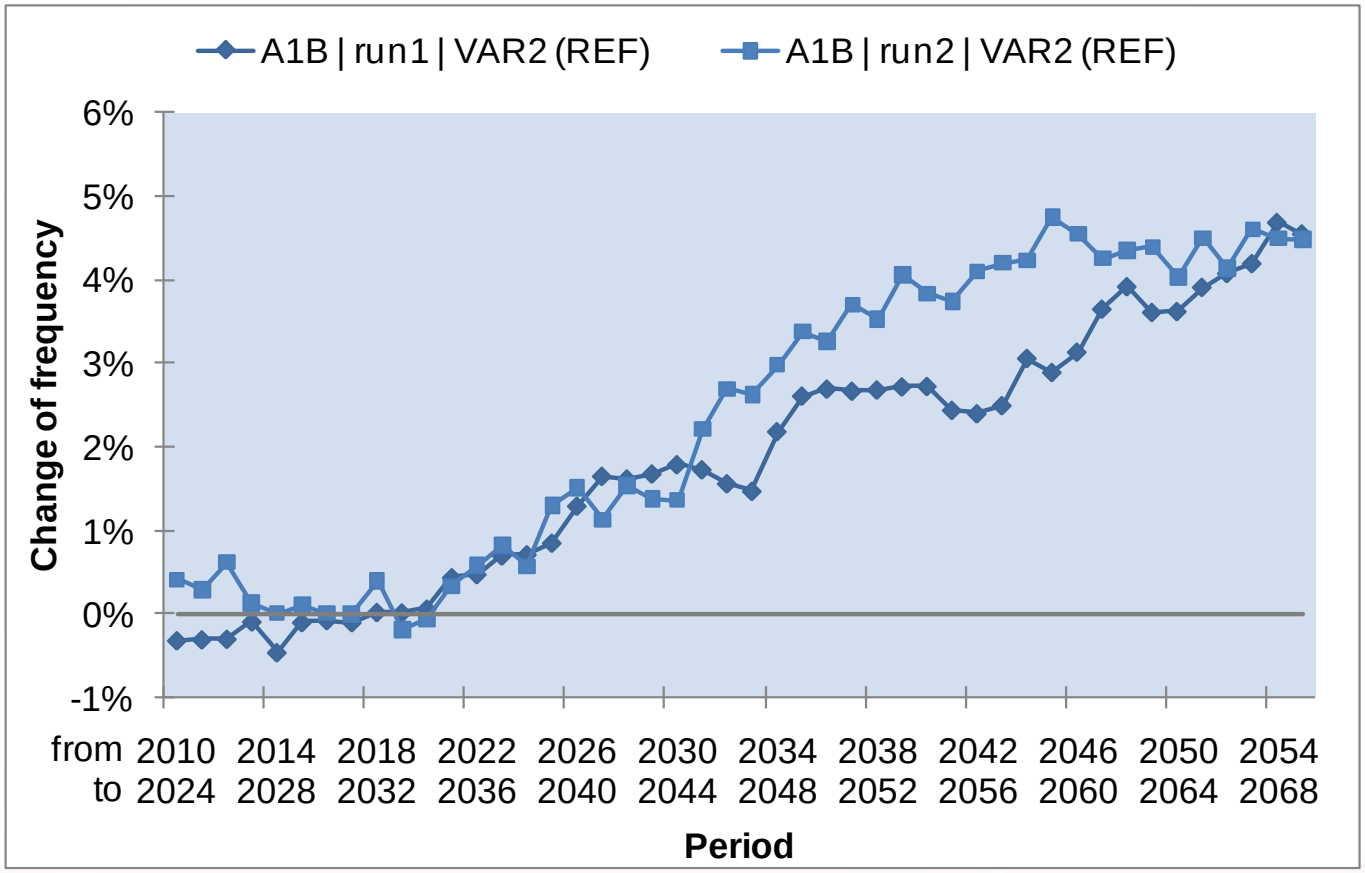

Predicted absolute changes of 15-years mean frequencies for **T > 15°C** related to the mean frequencies of the period 1980-2009.

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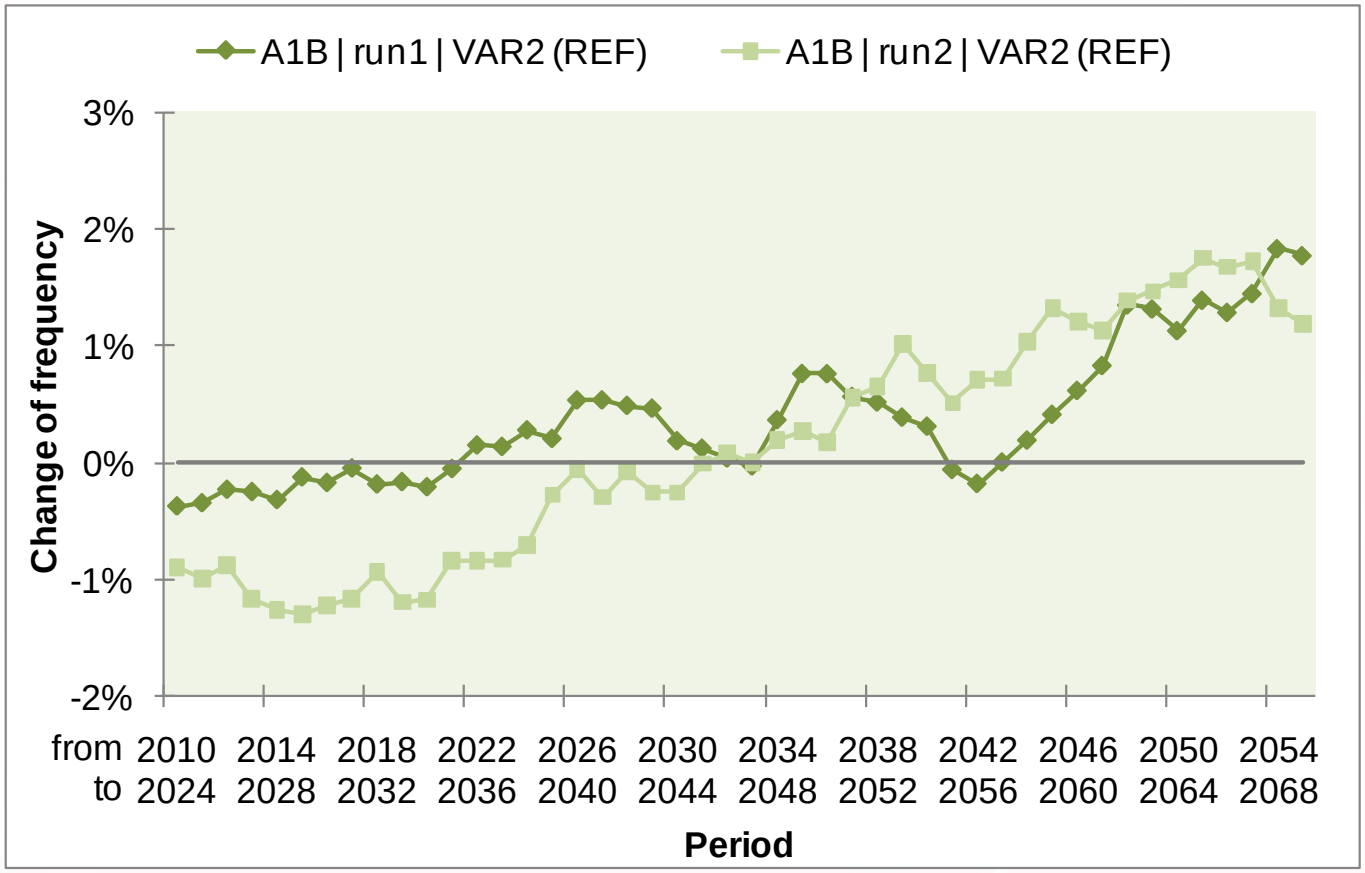
Thermal prediction simulations for asphalt pavements

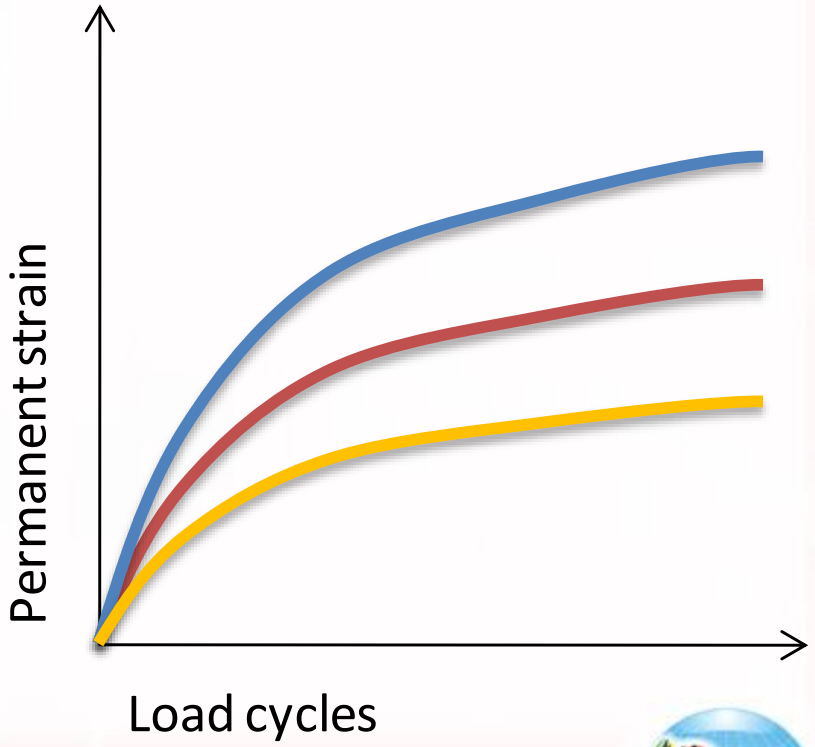


Predicted absolute changes of 15-years mean frequencies for **T > 30°C** related to the mean frequencies of the period 1980-2009.

Simulation and prediction of rutting development

triaxial apparatus used at TU Dresden for the triaxial tests

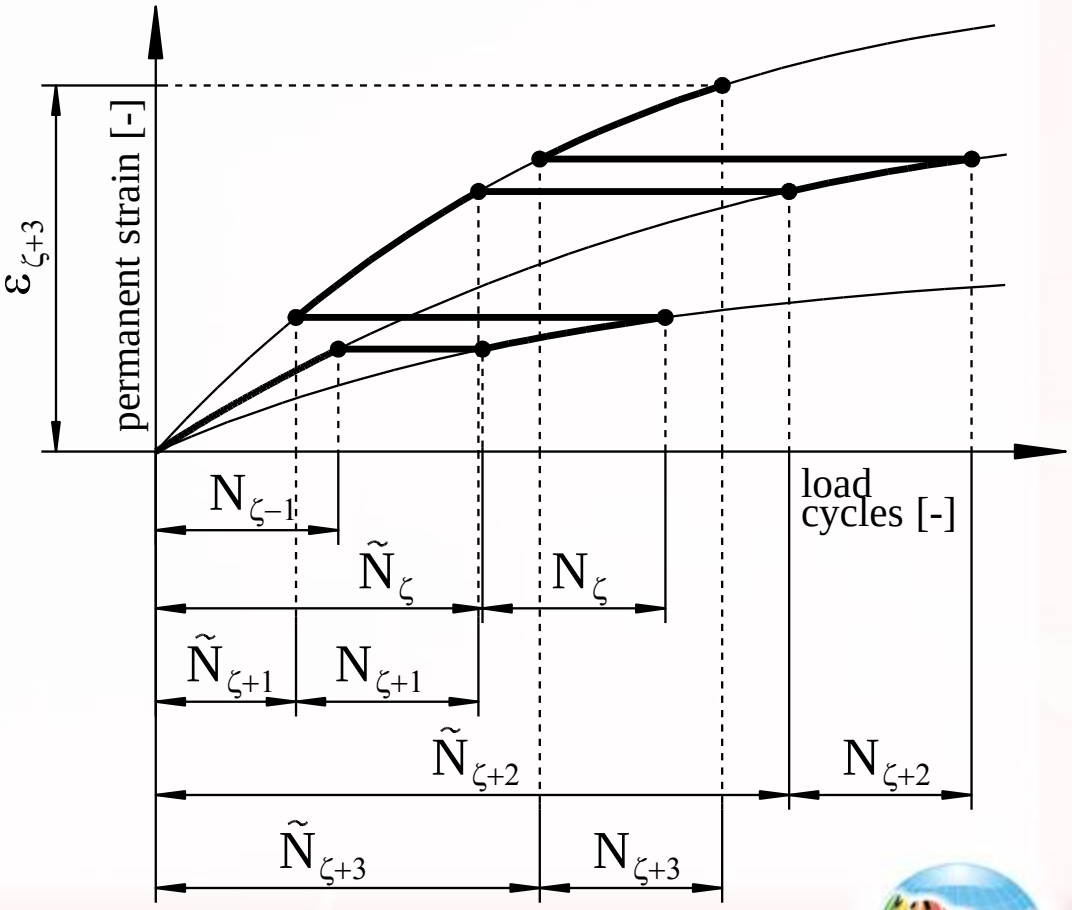
determination of **impuls creep curves** using triaxial test results



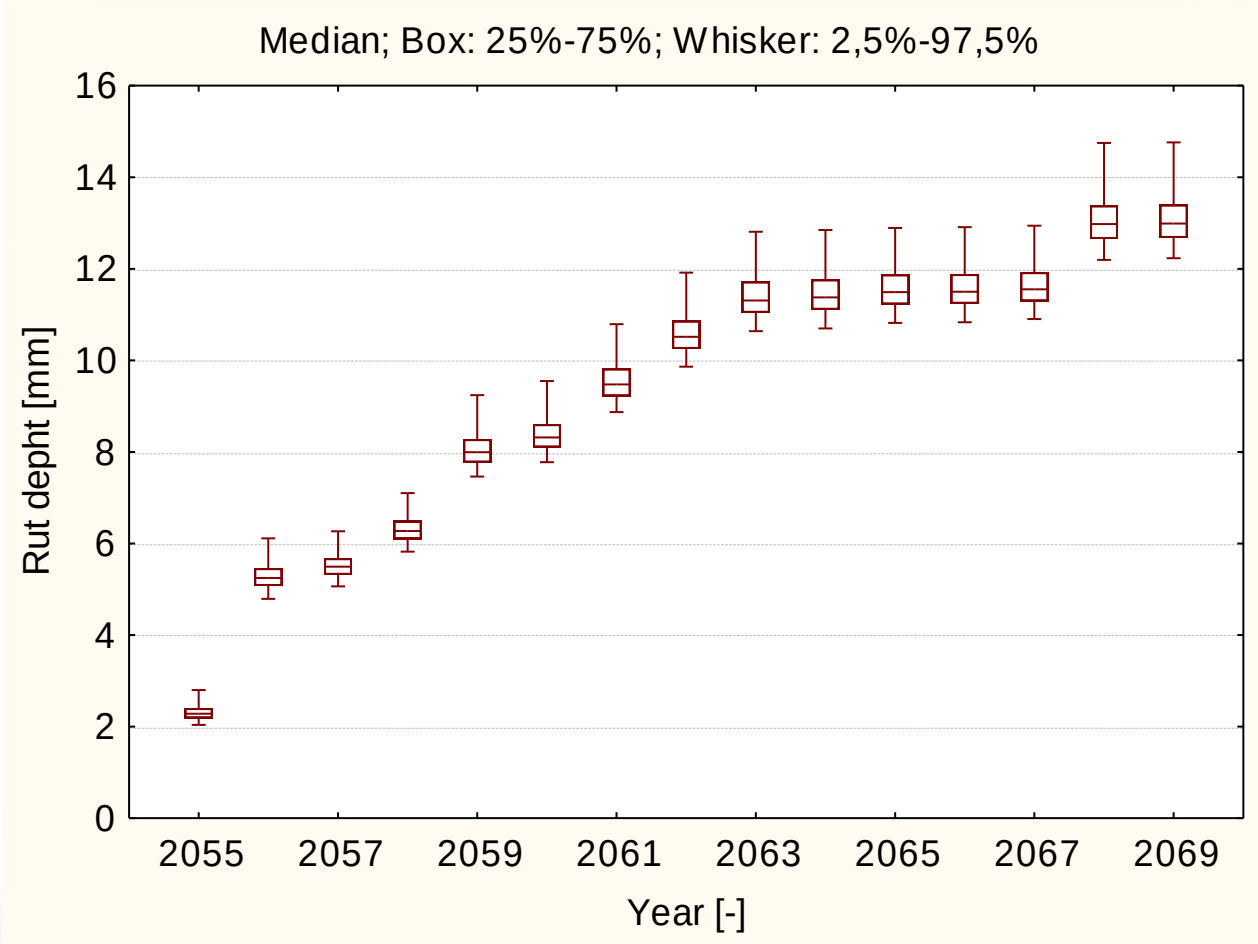
Simulation and prediction of rutting development

$$\varepsilon = A \cdot \ln(N+1)^B$$

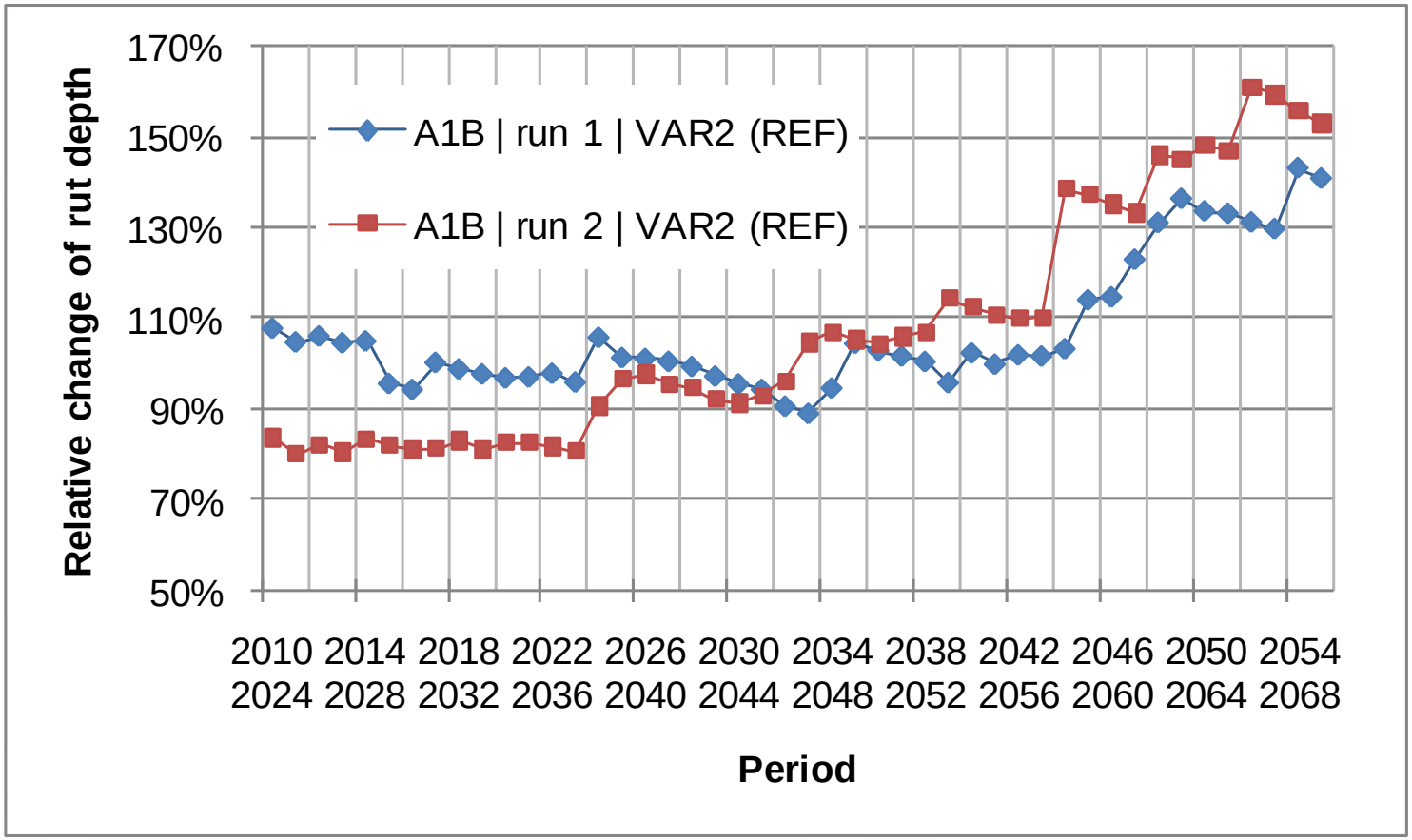
ε = permanent strains [‰]
N = number of load cycles [-]
A, B = material parameters [-]



Model calculation



Model calculation



Conclusions

- One of the most frequently occurring damage is permanent deformation of pavement surface as a result of the deformation of individual layers
- It is most likely, that the climate will be changed in this century
- It is also most likely, that the rut formation will be significant increase in consequence of changing thermal condition in asphalt pavement structures
- The extent of the permanent deformations of asphalt pavements can be affected significantly influencing thermo-physical material properties specifically

Thank you very much for your attention and interest !