EU COST action P6 „Magnetofluiddynamics“
Working Group „Use of magnetic fields in crystral growth
Workshop: Use of magnetic fields in crystal growth
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3D simulation and experimental verification of recirculated turbulent melt flow

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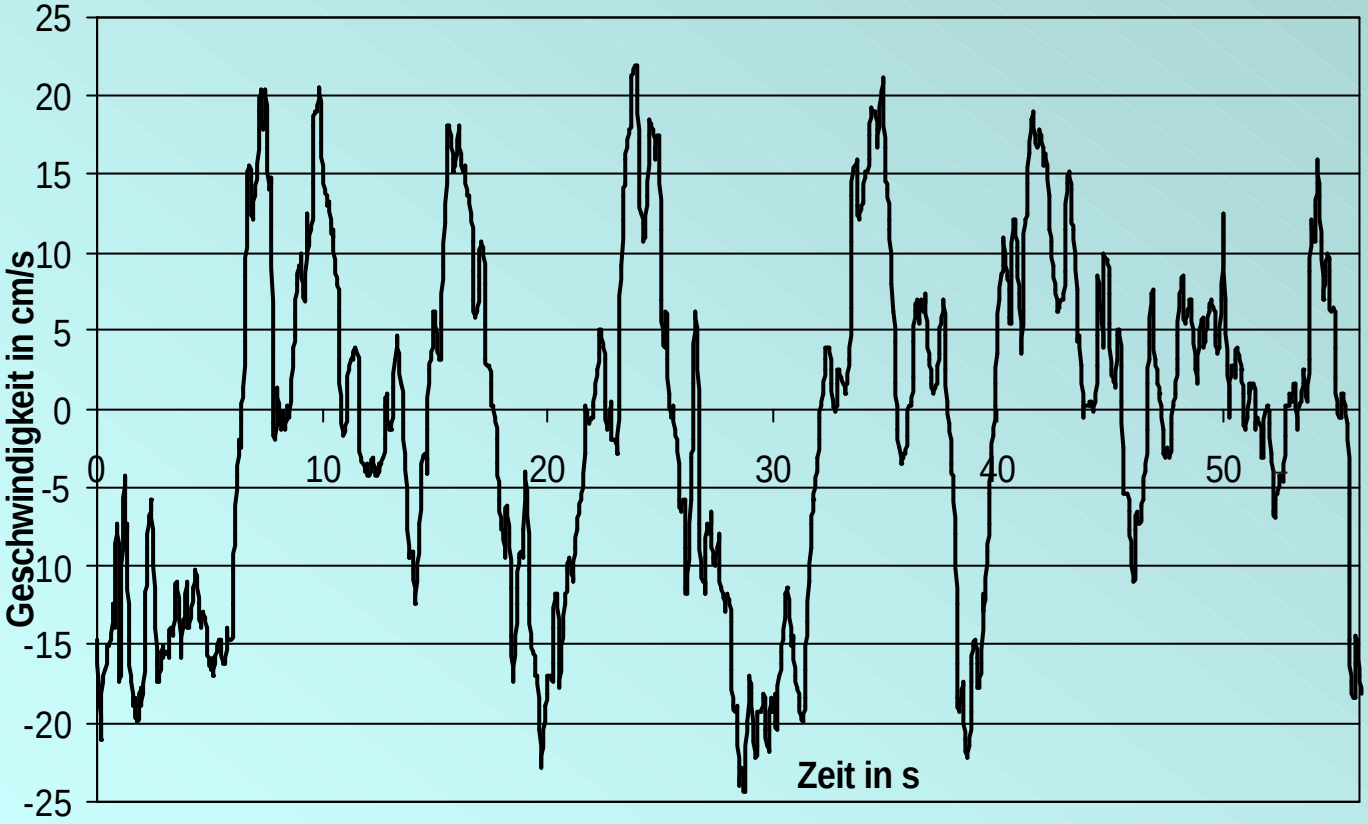
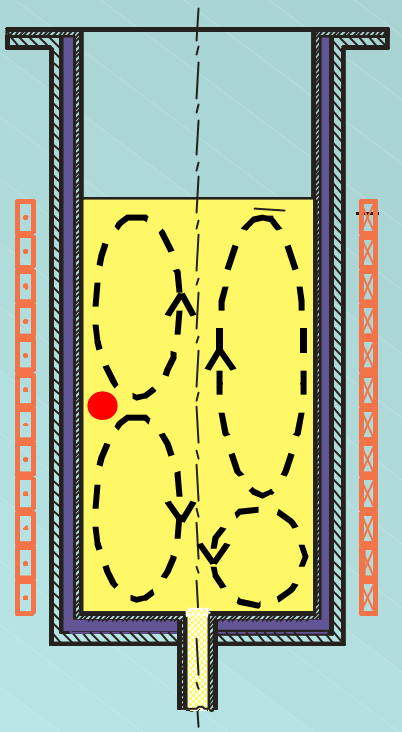
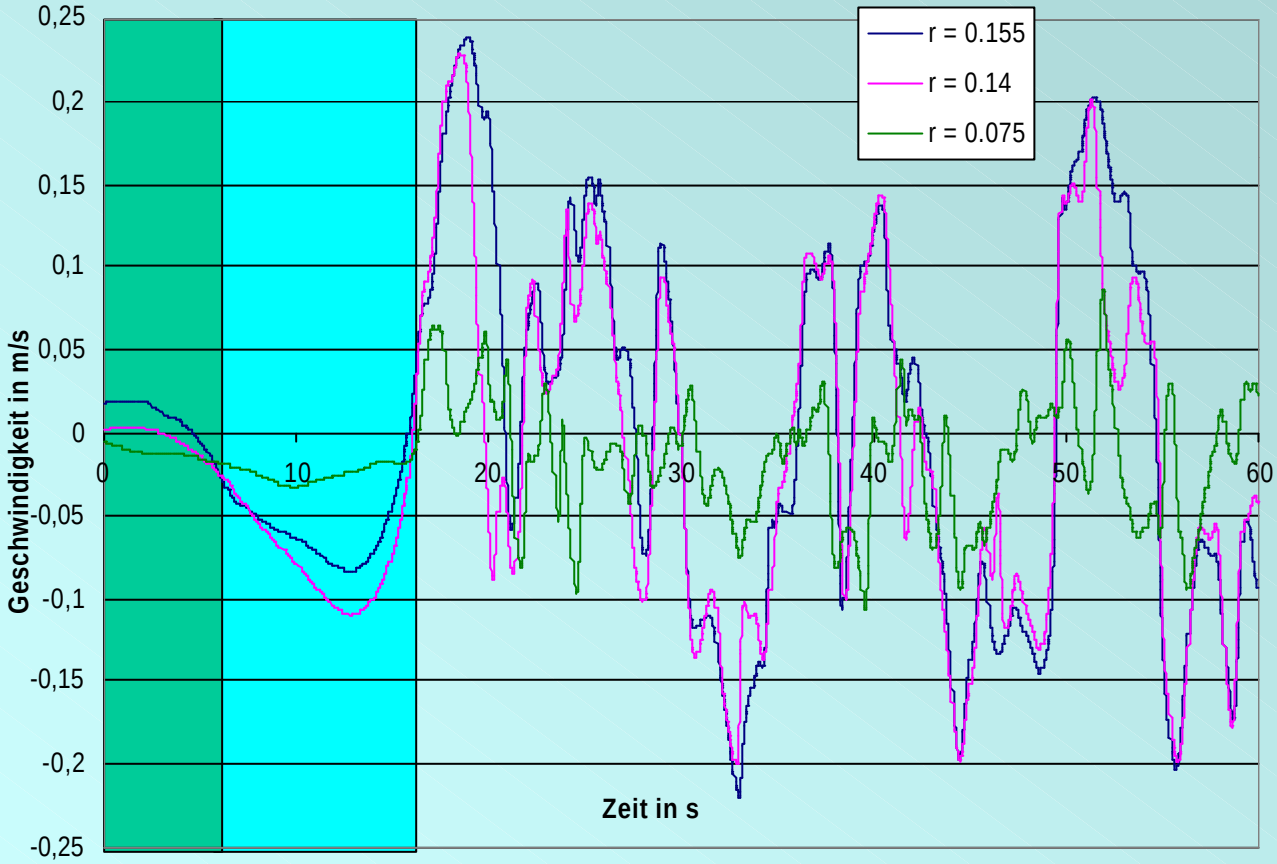
Measurement of local flow velocity (ICF): Near the crucible wall between the main flow eddies

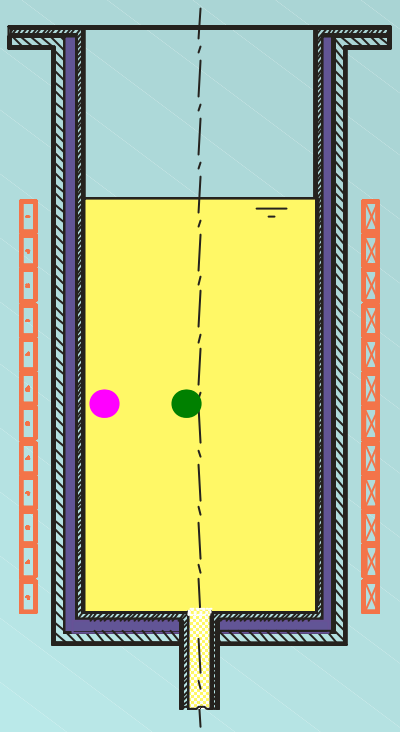




- Low-frequency oscillations
- Oscillation period: 8...12 sec

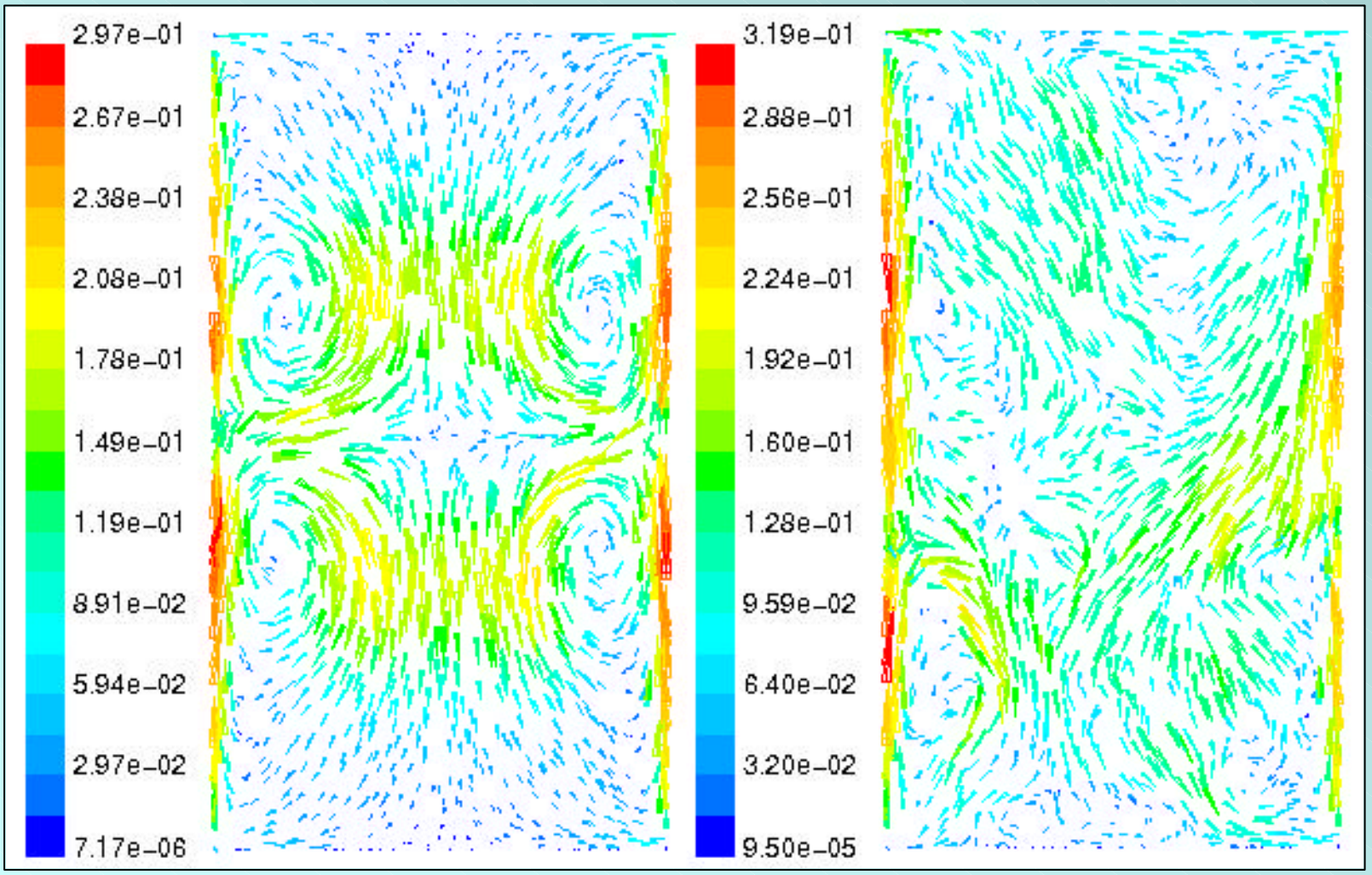
Calculated local flow velocity: 3D transient Large Eddy Simulation (LES)





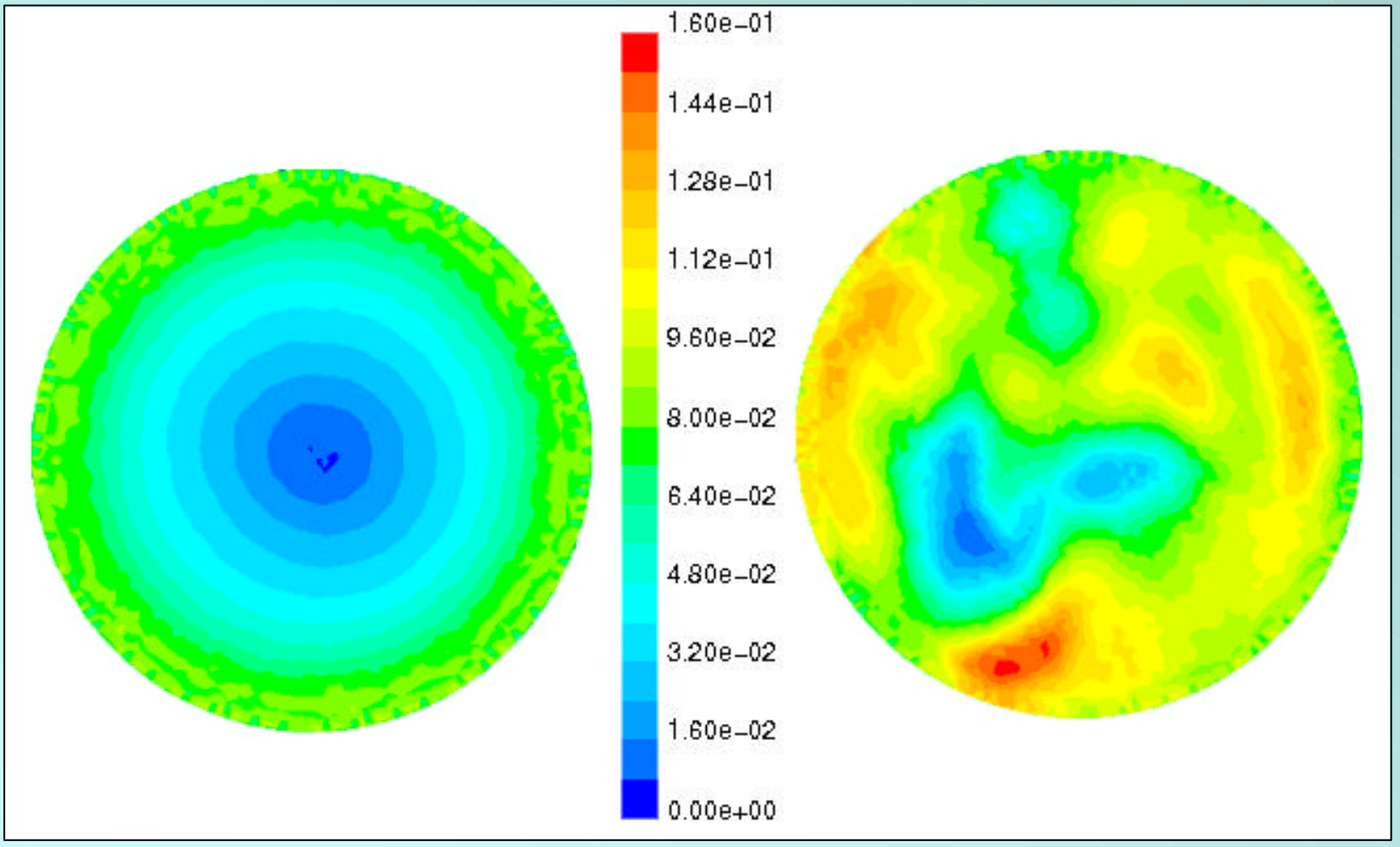
- Low-frequency oscillations
- Oscillation period: appr. 10 sec

Calculation of the melt flow velocity in the ICF: (3D transient LES)



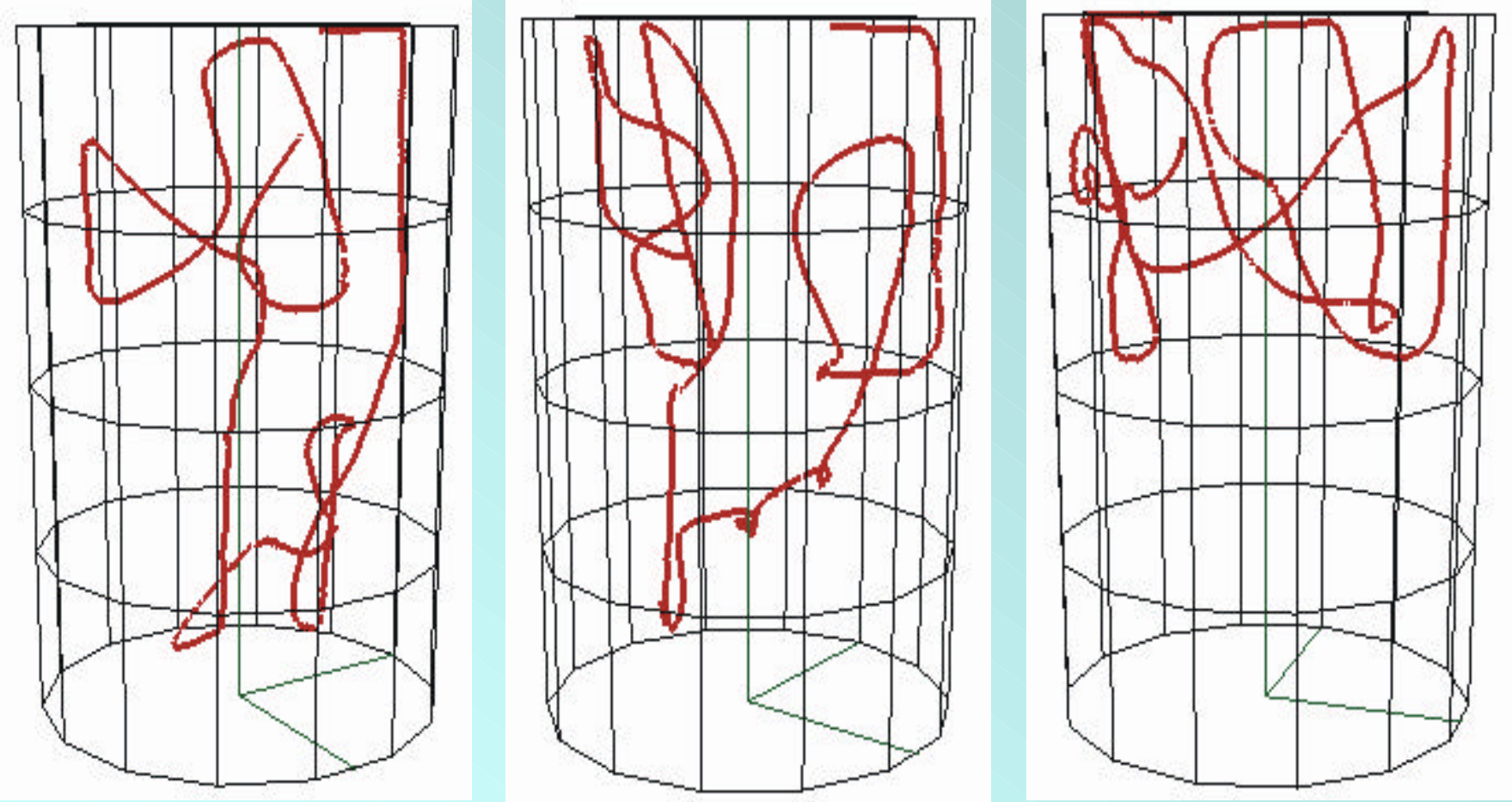
calculated time: 5 sec **calculated time: 40 sec**

Calculation of the melt flow velocity in the ICF: Melt surface (3D transient LES)



calculated time: 5 sec **calculated time: 40 sec**

Calculation of the particle tracing in the melt of the ICF (3D transient LES)



Conclusions

- Heat and mass transfer processes in the melt of induction furnaces are significantly influenced by large scale low-frequency oscillations of the recirculated flow main eddies
- Results carried out the first time applying the 3D transient LES turbulence model are in good agreement with the corresponding experimental data
- This numerical tool using the 3D transient LES model offers new possibilities for the simulation of turbulent melt flows as well as heat and mass transfer processes in industrial induction furnaces