Aeroelastic simulation of a multi rotor wind turbine system

Why multi rotor wind turbine systems?
In times of ever growing wind turbines and their components, the industry is facing new challenges in manufacturing, transportation, strength and fatigue of wind turbine components. A multi rotor wind turbine system (MRS) is not a completely new concept, but is largely unexplored in theory and practice.

- Utilization of the square-cube-law
- Higher technical availability
- Load averaging
- Active or passive yaw system possible
- Assumed better behavior in a turbulent wind field, due to smaller and less inert rotors

Aeroelastic simulation with BLADED:

- Steady and turbulent power curve
- Load averaging for hub $F_x$ and hub $M_y$ for wind speeds around rated wind speed and different turbulence models (Mann and Kaimal)
- Selected design load cases (DLCs) according to the IEC 61400-1 (third edition) guideline
- Variation of wind field grid size and interpolation method between grid points

Results summary:

- Load averaging for hub $F_x$ and hub $M_y$ even for four rotors developed
- Ultimate loads with Kaimal turbulence higher than for the Mann turbulence
- Maximum ultimate load for DLC 1.3 (power production with extreme turbulence model ETM), followed closely by DLC 4.2 (normal shut down with extreme operating gust (EOG)) and DLC 1.4 (power production with extreme coherent gust with direction change (ECD))
- Hub $M_y$ more sensitive than hub $F_x$ against grid size and interpolation variation
- Linear interpolation in rotor plane causes more developed changes in loads than linear interpolation in along-wind direction
- Generated Power $P_e$ relatively unchanged for all variations of grid and interpolation