ID: 1.6.1a

Title: Linear scaling approaches for density functional calculations

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The size of the systems which can be studied by density functional theory has been continuously increasing over the years due to advancing supercomputer technology and improved efficiency of calculation techniques. Systems with hundreds of atoms can be treated routinely today, but the usual cubic scaling of the computational time with the number of atoms severely limits the extension to larger systems. Here a breakthrough can be expected by newly developed techniques aiming at linear scaling. In my presentation I will give a short overview on the different methods and will identify common principles leading to linear scaling. In detail I will discuss a method recently developed in J\"ulich for metallic systems which are particularly challenging compared to systems with band gap because of long-ranged density and potential perturbations. I will show that our method gives accurate results for systems with thousands of atoms and that it can be used with high parallel efficiency on up to a hundred thousand of processors.