In this work, we present a novel approach to simulate large emitters in the microscale. The main idea is to combine a nested grid approach and a finite element model to simulate the subgrid scale. The nested grid system consists of the mesoscale meteorological model WRF-ARW, the Air Emission Model of Meteosim (AEMM), and the air quality model CMAQ. The subgrid scale is simulated using an adaptive, Eulerian, non-steady finite element model. The results from the nested grid simulation are used as initial and boundary conditions in the subgrid model, making this approach one-way. A simulation has been carried out in the surroundings of Barcelona, where an important contributor to the sulphur dioxide levels is considered. The simulations were carried out for one episode with high levels of sulphur dioxide. The time period of the simulation was 48 hours with a 24-hour spin-up.