RAMBOLL

ENVIRONMENT
& HEALTH

SCICHEM AIR QUALITY MODEL

Ramboll co-developed an advanced reactive puff model that estimates emission source impacts on pollutants.

ABOUT SCICHEM

The Second-Order Closure Integrated Puff Model with Chemistry (SCICHEM) is a state-of-the-science reactive puff model that can be used to model the impact of single or multiple emission sources on primary and secondary pollutants. USEPA names SCICHEM in guidance on models suitable for assessing single-source impacts to ozone and $PM_{2.5}$[1].

OUR SERVICES

Ramboll develops and maintains all of the photochemistry in SCICHEM, which enables the evaluation of secondary pollutant impacts.

The atmospheric chemistry modules in SCICHEM include gas-phase reactions, aerosol transformations and aqueous-phase chemistry for a multitude of chemical compounds – including ozone, NO, NO_2, HNO_3 and other oxidized nitrogen compounds, VOCs, SO_2, $PM_{2.5}$ and components, NH_3, mercury, arsenic, selenium and chromium[2-10].

Ramboll scientists have implemented SCICHEM in USEPA's photochemical grid model CMAQ as a "plume-in-grid" method for ozone, PM and mercury[11-20]. Additional SCICHEM development and application studies we have conducted include the following.

- Testing for single-source secondary impacts[4]. Learn more at ramboll.com/puff.
- Modeling of highly reactive VOC emissions from a ship channel[5]. Learn more at ramboll.com/plume.
- Application for near- and far-field single-source impacts[6]. Learn more at ramboll.com/near-field.
- Application for 1-Hour NO_2 concentration assessments[7]. Learn more at ramboll.com/no2.
- Investigation of NO_x reactions and transport in night-time plumes, as well as impacts on next-day ozone[8]. Learn more at ramboll.com/nox.
- Evaluation using aircraft-based plume measurements[9]. Learn more at ramboll.com/aircraft-plume.
- Development of a multimedia model for assessing human health impacts of arsenic, cadmium, chromium, lead, mercury and selenium from power plant stacks (involves ongoing research).

CONTACT

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*See page two for all references.

$$c(x) = \frac{Q}{(2\pi)^{3/2}(Det(\sigma))^{1/2}} \exp\left[-\frac{1}{2}\sigma_{ij}^{-1}(x_i - x_i)(x_j - x_j)\right]$$

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