

An Integrated Assessment of the Synergism between Anthropogenic Port Emissions and the Natural Marine Environment

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Background

- **The ports of Los Angeles and Long Beach serve as the entry point for half of the cargo containers entering the western United States annually.**
- **Emissions from the ports cause significant health impacts both directly and from the secondary air pollutants they form via chemical reactions in air.**

Objective

To gain an in-depth understanding of the unique interactions between marine emissions and those from anthropogenic emissions associated with the ports.

Measurements, fundamental experimental chemistry, mathematical modeling, energy engineering, as well as toxicological and epidemiological studies.



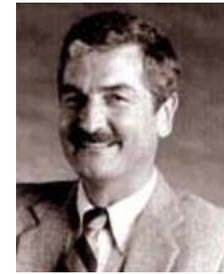
Whole Air Canister Measurements

- Chlorine and bromine importance
- Emissions of VOCs and sulfur compounds
- Source and ambient sampling
- Tracer studies

Laboratory Experiments



- High resolution characterization of PM
- Are there organic sulfates in addition to inorganics?
- SO₂ uptakes in/on aerosols made of nitrate and chlorine mixtures.
- Does OH form on the surface of particles to oxidize SO₂?



Energy and Air Quality

- Implementation fuel cell hybrid to determine emission reduction and air quality impact
- Use of alternative fuels on ships.
- Mitigation of port greenhouse gases
- Refinement of emission inventories
- Integrated air quality simulations of port.
- Electrification of port = hoteling + port operations

Health



- Epidemiological studies from hospital records
- Toxicological testing--Incubate particles on rats to examine biological response
- Ultra sound study to determine physical characteristics and blood flow to embryo
- Characterization of diesel fingerprint
- Toxicological testing
- Health effects of CINO₂ and CINO: Collaboration with Kleinman