Assessing Curriculum Efficiency Through Monte Carlo Simulation

David Torres, Northern New Mexico College

A Monte Carlo algorithm is designed to predict the average time to graduate by enrolling virtual students in a degree plan. The algorithm can be used to improve graduation rates by identifying bottlenecks in a degree plan (e.g., low pass rate courses and prerequisites). Random numbers are used to determine whether students pass or fail classes by comparing them to institutional pass rates. Courses cannot be taken unless prerequisites and corequisites are satisfied. The output of the algorithm generates a relative frequency distribution which plots the number of students who graduate by semester. Pass rates of courses can be changed to determine the courses that have the greatest impact on the time to graduate.
Prerequisites can also be removed to determine whether certain prerequisites significantly affect the time to graduate.

Biomass Burning Aerosols and Air Quality in the Southwest U.S.

Kip Carrico, Associate Professor, New Mexico Tech
Jared Lam, Undergraduate Student, New Mexico Tech

Abstract:
U.S. efforts over the past several decades to control air pollution emissions have been largely successful in improving ambient air quality in urban areas. Contrastingly, emerging regional trends demonstrate increasing impacts from biomass burning emissions in the southwest US. Though traditionally considered a 'natural' source, stronger links of smoke to a changing climate and other human perturbations are emerging. Our research in collaboration with Los Alamos National Lab researchers, has completed over 300 combustion experiments with a selection of native and invasive plant species from New Mexico. The presentation will discuss such trends and present specific results on the detailed physical properties of smoke aerosols and their significance. Particle size distribution, light scattering, and light absorbing properties of aerosol particles play a vital role in determining aerosol impacts. Such aerosol physical properties, and their relation to external influences such as humidity and combustion characteristics, determine the resulting aerosol impacts on human health, visibility, atmospheric chemistry and significance to climate. Results to date and future efforts will be discussed.

The Development of a System to Measure Humidity-Dependence of Aerosol Optical Properties

Jared Lam, New Mexico Tech
Kip Carrico, New Mexico Tech

Abstract

Aerosols scatter and absorb radiation entering the Earth's atmosphere, which results in either a cooling or a warming effect, respectively. For many aerosol species, these optical properties are influenced by the ambient relative humidity (RH). As particles swell with increasing RH, light scattering increases and aerosol intensive optical properties are altered. At deliquescence humidity, the particle experiences significant growth and consequent effects on its optical properties. The magnitude of this humidity-dependence is a result of heterogeneity of aerosol chemical composition. We have developed a system to measure the humidity-dependence of aerosol optical properties by alternating between dried (RH<20%) and humidified (RH>80%) conditions to measure hygroscopic growth factor f(RH) for light scattering and absorption. The optical properties are measured by a Cavity-Attenuated Phase Shift spectrometer (CAPS PM_{ex}) which is designed to measure light-scattering and -extinction by particles at a wavelength of 450nm. Differencing light extinction and scattering gives light-absorption, a parameter whose RH dependence is highly uncertain. In concert with other aerosol chemical and physical measurements, this improves the scientific understanding of the influence of aerosols on climate change.

Perspectives on publishing: peer review, impact, significance

Prof. Lawrence J Berliner, PhD
Department of Chemistry and Biochemistry
University of Denver
Colorado, USA

The author is Editor in Chief of two international journals: Cell Biochemistry and Biophysics and The Protein Journal. The talk will discuss: purpose of writing (what is a) scientific paper; Why publish? Key Elements of Publishing; Structure of a paper; Peer review - What is it? Scientific fraud has become a major problem; What journal to choose? Rules for the future for successful science and papers