

AIR POLLUTION MODELING

Theories, Computational Methods
and Available Software

Paolo Zannetti*

AeroVironment Inc.
Monrovia, California



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VAN NOSTRAND REINHOLD
_____New York

* Currently at IBM Bergen Scientific Centre, Norway

To those who loved me

Dr. P. Zannetti
IBM Scientific Centre
Thomohlensgate 55
Bergen High Tech Centre
N-5008 Bergen, Norway

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Preface

Finishing this book is giving me a mixture of relief, satisfaction and frustration. Relief, for the completion of a project that has taken too many of my evenings and weekends and that, in the last several months, has become almost an obsession. Satisfaction, for the optimistic feeling that this book, in spite of its many shortcomings and imbalances, will be of some help to the air pollution scientific community. Frustration, for the impossibility of incorporating newly available material that would require another major review of several key chapters — an effort that is currently beyond my energies but not beyond my desires.

The first *canovaccio* of this book came out in 1980 when I was invited by Computational Mechanics in the United Kingdom to give my first Air Pollution Modeling course. The course material, in the form of transparencies, expanded, year after year, thus providing a growing working basis. In 1985, the ECC Joint Research Center in Ispra, Italy, asked me to prepare a critical survey of mathematical models of atmospheric pollution, transport and deposition. This support gave me the opportunity to prepare a sort of “first draft” of the book, which I expanded in the following years.

The expert reader will notice that this book is uneven. Subjects that I feel comfortable with are discussed extensively, while other subjects are only briefly summarized. I have tried to compensate, with abundant reference citations, for my lack of deep knowledge in some of the technical fields discussed here. Also, I have tried to be fair in the critique of the different modeling techniques, even though some bias is noticeable when, for example, the properties of Lagrangian versus Eulerian models are discussed.

The list of people and organization to thank is endless. I must start with Ivar Tombach who, since 1980, has encouraged me to complete this endeavor and has provided substantial moral and practical support. Then, I want to thank AeroVironment, Inc., the company I have been associated with in the 80's, for having provided an outstanding working environment and continuous, interesting technical challenges. Thoughts of appreciation also go to the IBM Scientific Centers for which I worked in the 70's. I will always be grateful to IBM Italy for getting me involved, in 1971, with air pollution modeling research and for introducing me to a scientific field — environmental modeling — that I have found very satisfactory and rewarding for two decades.

I submitted each chapter of this book to a few reviewers. It is difficult to critique a chapter without reading the entire publication. Nevertheless, their comments and constructive criticism were very useful in finalizing my work. I apologize to some of the reviewers for not being able to incorporate all their suggestions. I hope to do so in the future, if and when a new edition is printed. The reviewers were: Domenico Anfossi, Michel Benaire, Robert Bornstein, Richard Boubel, Gary Briggs, Steven Hanna, Brian Henderson-Sellers, Frans Nieuwstadt, Arnaldo Longhetto, Walter Lyons, Roger Pielke, Chris Pilinis, Brian Sawford, Christian Seigneur, John Seinfeld, Tom Tesche, David Thomson, Tiziano Tirabassi, Paul Urone, Eric Walther, and Robert Yamartino. (A special thanks goes to Tom Tesche who, after reviewing one chapter, found the time to look at the entire manuscript and provided useful general comments.) All reviewers made valuable contributions; errors and omission, however, are only my fault.

This book would never have been published without the efforts and dedication, beyond the line of duty, of Wendy Webb who prepared, using Interleaf® Technical Publishing Software, the camera-ready version of the manuscript. I really owe you a lot W^2 ! Anita Spiess provided outstanding editorial help. I learned a lot from her editorial changes and her constant struggle for clarity, conciseness and logical sequence.

This book is dedicated to those who loved me. First and foremost, to the memory of my parents, who gave so much and asked for so little.

PAOLO ZANNETTI

Monrovia, California
February, 1990

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