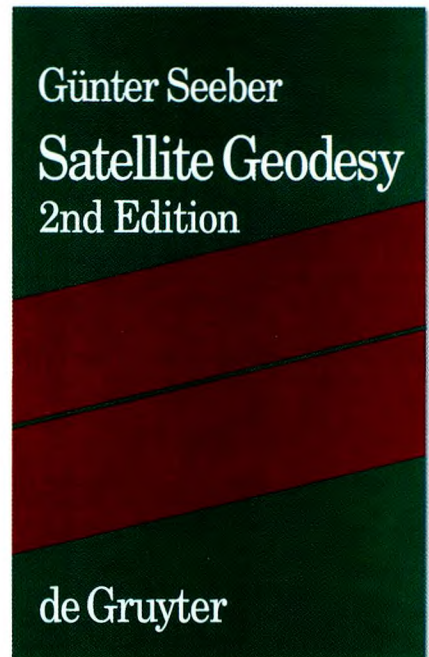**Book Review**

Satellite Geodesy: Foundations, Methods and Applications, Second Edition

By Günter Seeber, 589 pages, 281 figures, 64 tables, ISBN: 3-11-017549-5, published by
Walter de Gruyter GmbH & Co., Berlin, 2003

The first edition of this book came out in 1993, when it made an enormous contribution to the field. It brought together in one volume a vast amount of information scattered throughout the geodetic literature on satellite missions, observables, mathematical models and applications. In the intervening ten years the field has developed at an astonishing rate, and the new edition has been completely revised to take this into account.

Apart from a review of the historical development of the field, the book is divided into three main sections. The first part is a general introduction to the fundamentals of the subject: reference frames; time systems; signal propagation; Keplerian models of satellite motion; orbit perturbations; orbit determination; orbit types and constellations. The second section, which comprises the major part of the book, is a detailed description of the principal techniques falling under the umbrella of satellite geodesy. Those covered are: optical techniques; Doppler positioning; Global Navigation Satellite Systems (GNSS, incorporating GPS, GLONASS and GALILEO), Satellite Laser Ranging (SLR), satellite altimetry, gravity field missions, Very Long Baseline Interferometry (VLBI) and Interferometric Synthetic Aperture Radar (InSAR). The final section gives an overview of how satellite geodesy contributes to the fields of terrestrial and marine physical and geometrical geodesy, navigation and geodynamics.

The book is written in an accessible style, particularly given the technical nature of the content, and is therefore useful to a wide community of readers. Every topic has extensive and up to date references allowing for further investigation where necessary. A useful list of the major institutions that contribute to international collaborative programmes is included, as well as associated web resources.

As in the first edition, the various topics addressed are not covered with a uniform level of detail. Thus whilst 190 pages are dedicated to GPS, satellite altimetry is explained in a mere 22. To a certain extent this does reflect the number of individuals and institutions that are likely to be concerned with the respective techniques.

At first glance one may wonder why optical techniques and the discussion of Transit Doppler have been retained. However, the wide application of star sensor-based attitude control on satellites and the application of astrometric satellites such as HIPPARCOS to developing enhanced star catalogues justify the former, and the increasing quality and contribution of DORIS, the French Doppler system, justify the latter.

The role of the new gravity field missions, CHAMP and GRACE, as well as the developments towards operational oceanography and proposed and pending missions such as GOCE and GALILEO are covered. It is quite an achievement to have kept the printed version so up to date, and the result is that the book represents well the state of the art in 2003.

From the point of view of completeness where the book falls somewhat short is in the treatment of the linearisation of the mathematical models and the relationship between the instrument observables and the parameters of interest (for example, positions, gravity field coefficients and so on). An explanation of the role of the state transition matrix and numerical integration of the variational equations would certainly round out the otherwise comprehensive nature of the book. In any case, references are made to other recent books that do treat the mathematics in adequate detail.

However, in reality the criticisms are mere nit-picking. Overall Gunter Seeber's book takes the place today that the first edition stepped into ten years ago: without doubt the best single reference on satellite geodesy in print.

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