Book Review

Radar Interferometry: Data Interpretation and Error Analysis. Remote Sensing and Digital Image Processing, by R. F. Hanssen, Vol 2, Kluwer Academic Publishers, 2001;
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As satellite coverage improves, radar interferometric techniques are becoming powerful and accessible tools for geodetic studies. InSAR (Interferometric Synthetic Aperture Radar) and DInSAR (Differential InSAR) techniques can give estimates of ongoing land deformations, which can be useful in seismic and volcanic monitoring, in subsidence, glacier and landslide studies, and are also applicable to the study of atmospheric conditions. However, these estimates incorporate a good deal of processing and a number of implicit assumptions, and it is important to take these factors into account to obtain correct estimates and to accurately gauge the uncertainties and limitations in them in order to extract reliable information.

This book, written by a well known authority on InSAR techniques, deals with just such issues, sharing the author's experience on application, describing common practices, and pointing out possible sources of error. This is not a textbook in which to learn the basics of InSAR, but rather a guidebook for people who are already familiar with the method. Indeed, Chapter 2 presents a brief history of radar, SAR, and InSAR, and a review of their basic concepts, but here and throughout the book many explanations are cursory and most equations are presented without derivation, although sufficient references are given for both. Thus, the book is oriented to a reader who is familiar with InSAR concepts, some of which are used before being explained, and wishes to apply them.

Chapter 3 describes a linearized, Gauss-Markov functional model for interferometry and discusses topography, deformation, and atmospheric mapping, the use of interferogram stacks, and three- and four-pass DInSAR. The stochastic part of the model is presented in Chapter 4; problems of decorrelation and sources of error are discussed, as well as how to include their influences in the stochastic model. Chapter 5 shows three illustrative examples of the use of repeat-pass interferometry for deformation monitoring and discusses phase-unwrapping strategies. Chapter 6 presents applications of InSAR to atmospheric monitoring, IRM (Interferometric Radar Meteorology), where apparent path length differences from radar images so close in time that topography can be assumed invariant can be used to infer changes in the reflectivity distribution in the atmosphere. Finally, appendices discuss a joint use of GPS and InSAR data, and the relation between the structure functions of refractivity and integrated signal delay.

In conclusion, this is a well written, well presented book (although some figures would benefit from larger lettering and others could use a color- or gray-code bar) with very extensive bibliography. This book should be quite useful as a guide for applying InSAR techniques and evaluating the possible errors and the confidence to be placed on the results.

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