Preface

All celestial bodies emit in the infrared, and half of the radiation of galaxies lies in this wavelength range. This domain is crucial for studies of the solar system, stars at the beginning and end of their lives, interstellar matter, and galaxies at all distances. Recent developments in observational techniques have been tremendous; several airborne observatories, many balloon flights, two large satellites (the American-Dutch-English InfraRed Astronomy Satellite (IRAS) and its successor, the European Infrared Space Observatory (ISO)), have been dedicated to this domain, as well as the smaller Japanese satellite, InfraRed Telescope in Space (IRTS). One dedicated small American satellite, the Submillimeter Wave Astronomy Satellite (SWAS), is presently in orbit, and many more are to come.

A fast-growing aspect of research in astronomy is the use of archive data. For example, data from IRAS, which ceased operations in 1984, are still actively used. Indeed, there have been many more publications from this archival research than from the initial exploitation of the observations by the principal investigator groups, probably by a full order of magnitude. Similarly, the archives of the Hubble Space Telescope are in a very active phase of exploitation which is proving to be extremely fruitful. The ISO archives are of unprecedented value because the far-infrared wavelength range has been so little explored before, in spite of the many facilities listed above. Their use, however, is more difficult than those of the Space Telescope due to their novelty and to the complexity of the instrumentation and the observation modes of this satellite.

The ISO made its first observations on 28 November 1995 and ceased operating in April 1998 due to completion of the evaporation of the cryogenic liquid helium, well after the nominal duration of the mission of 18 months. ISO was a full success. The four ISO instruments operated very well in spite of their complexity. All the data obtained with ISO are progressively being made available in the public domain via well–organized archives, and their systematic exploitation is beginning.

The purpose of Session LXX of the Les Houches Summer School was to attract a new community of scientists, ranging from graduate students to senior researchers, to this field of research. In total, 48 people attended the four-week session in the beautiful setting of the school. They learned the basis of infrared astronomy, and, equally as important, from how to use the archival data the ISO. This will help prepared them for the many

infrared and submillimeter space facilities planned for the future: ODIN (launched in 1999), MAP (2000), SOFIA (2001), SIRTF (2002), IRIS (2002), PLANCK SURVEYOR (2007), FIRST (2007), etc.

The lectures covered the whole spectrum of infrared astronomy. The first courses gave an introduction to the basic physical processes, methods of detection, and data processing, etc. Then, a series of lectures dealt with the wide variety of astronomical objects as seen in the infrared, from planets and comets to interstellar matter, newly born and evolved stars, and galaxies nearby or at the largest observable distances. It will be interesting to consider the progress made recently, in particular as a result of the ISO observations, by comparing these lectures to the papers of these workshop held at the Centre de Physique des Houches in June 1991. The latter was devoted to the scientific preparation of the ISO mission and published in the book "Infrared astronomy with ISO", ed. Th. Encrenaz and M.F. Kessler, Nova Science Publishers, New York, 1992.

An important and original aspect of the teaching of the Session consisted in the practical work on ISO observations, which allowed the participants to visualize and handle these data, to perform new reductions, and to compare ISO observations with data at other wavelengths. Four powerful SUN workstations with 12 X-terminals were available with all the necessary reduction software and a collection of ISO data, as well as other, complementary data. Highly competent assistants introduced the participants to the reduction (and pitfalls!) of the data and helped them constantly in their work. This was especially appreciated by the participants, who were enthusiastic about this experience.

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- SUN Microsystem Computers generously lent their four powerful workstations, other computing equipment. SPRING Systems also provided some equipment on loan, while the CEA lent terminals and other equipment. IDL allowed free use of their software for the duration of the school. The help of the Service d'Astrophysique of the CEA was invaluable in assembling and testing this set–up in Saclay; including all the software, and then in transporting, installing, testing and maintening it at Les Houches; we wish to convey our warmest thanks to Laurent Vigroux, the Head of the Service d'Astrophysique, and especially to Françoise Gaulier, the Chief computing engineer of the Service, for their constant and enthusiastic help without which the practical work could well have been a failure.

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- The session ran very smoothly thanks to the management of Isabel Lelièvre and Brigitte Rousset. We also wish to thank all the other personnel at the school, in particular the restaurant personnel; for their kindness and efficiency.

- Last but not least, we thank the lecturers for their courses, all of which were of a high standard. They all finally returned a written account and are to be commended for the quality of these write-ups; thanks to their efforts and devotion, the present book is likely to become a standard reference in the field.

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