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Some Aspects of the Formation of the Solar System

Springer

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ISSN 2191-5369 ISSN 2191-5377 (electronic)
SpringerBriefs in Earth Sciences
ISBN 978-3-319-17830-1 ISBN 978-3-319-17831-8 (eBook)
DOI 10.1007/978-3-319-17831-8

Library of Congress Control Number: 2015936289

Springer Cham Heidelberg New York Dordrecht London

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media (www.springer.com)

Preface

This book is devoted to the problems that occur when attempting to understand and construct a concise representation of the original conditions, composition and dynamics of the evolution of the Earth-Moon system in the form in which it is seen today. This volume will perhaps contribute to a better understanding of what is necessary to research the dynamics of the Solar system.

The complexity of the problem demands great effort from many generations of outstanding scientists. In the introduction, which by no means claims that this work is comprehensive, we wish to illustrate the idea that any weaknesses in the conclusions and the obtained consequences are mainly due to the limitations of the observed experimental data, the analytical base of the geochemical and isotopic research, and the possibilities of astronomy and geophysical methods. That problem is addressed in the first chapter.

In other chapters, attention is mainly directed to the presentation of researching results on the dynamics of the formation of the Earth and Moon, which are based on Safronov's accumulation model and the results of numerical mathematical modelling. These results show that the account of heat release from the decay of short-living radioactive elements leads to the early heating of pre-planetary bodies and makes the collisions inelastic. The consequence of that is the realization of the process of matter differentiation, which results in the combining of fragments enriched by iron with a low melting temperature, while the more infusible silicate parts remain in the proto-planetary cloud. A significant role in the thermal balance of the growing planet was played by the existence of a poorly transparent atmosphere with a large amount of silicate dust. Finally, we present the first results obtained by numerical solution of the evolutionary problem for a 3-D medium

model, which describes the development of thermal heterogeneities, which are stipulated by the random distribution of the bodies and particles falling on the surfaces of the growing Earth and Moon.

We are grateful to the Russian Fund of Fundamental Research for its support by the Grant 13-05-00138 and also to Petra van Steenbergen at Springer for support.

Miass, December 2014 Vsevolod N. Anfilogov
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