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Preface

The Geophysical Institute of the Academy of Sciences of the Czech Republic organised its 4th International Workshop on Heat Flow and the Structure of the Lithosphere at the Trest Castle in Southern Bohemia, Czech Republic, June 9–15, 1996. This meeting was the fourth of its kind held in the country, following the previous successful 'castle' workshops which took place at Liblice Castle in 1982 (*Tectonophysics*, 103 (1984), 1–356), at Bechyne Castle in 1987 (*Tectonophysics*, 164 (1989), 83–376; see also V. Cermak and L. Rybach, Eds., *Terrestrial Heat Flow and the Lithosphere Structure*, Springer-Verlag, Berlin, 1991, 507 pp.) and once more at Bechyne in 1991 (*Tectonophysics*, 225 (1993), 1–138; *Stud. Geophys. Geod.*, 37 (1993): 233–348). The fourth meeting in this series signified a nice established tradition and it was not surprising that the Trest-96 workshop represented a unique event which in the number of the attendees and the range of the programme surpassed similar sessions usually taking place within the big international assemblies.

The workshop was sponsored by the International Heat Flow Commission of the IASPEI and also by the International Lithosphere Programme and the European Geophysical Society. The meeting was attended by altogether 68 scientists from 23 countries and as such represented the largest gathering of the present, rather scarce, world heat flow community likely to have ever occurred. The formal statistics revealed 20 scientists from oversea (USA 11, Canada 6, Japan 1, New Zealand 1, Egypt 1), seconded by the Europeans (Germany 13, Russia 7, Italy 3, Finland 2, Romania 2, Slovenia 2, Switzerland 2, plus one scientist each from Albania, Belarus, Belgium, Denmark, Estonia, Hungary, Poland, Portugal, Spain and Ukraine), as well as 7 colleagues from the host country. The charming milieu of the renaissance Trest castle, venue of the meeting, the rich social programme and not in the least the beautiful spring weather contributed to the perfect satisfaction of all participants.

The major topics of the scientific discussions focussed on two general groups: (1) heat flow studies with special attention for 2-D and 3-D geothermal modelling of the crustal and lithosphere structures, heat flow–heat production relationship, deep temperature extrapolation techniques, advective vs. conductive heat transport and various geothermal aspects of deep continental drilling, and (2) climate-related borehole observations including inferred past climate changes, reconstructions of the ground surface temperature history and the air/soil temperature coupling.

As the end of the 20th century is approaching, the major scientific contributions of the basic geothermics to the Earth Sciences were discussed in a broad scope on the opening of the workshop. The careful evaluation of the rationale for thermal research in the next future aiming at international co-operation in the 21st century well flavoured all ongoing presentations during the whole workshop. The timely set combination of invited review presentations followed by selected shorter contributions in a number of pre-selected topical groups initiated spontaneous vivid discussions to an extent that surpassed all expectations.

This issue includes twenty-two selected papers that well demonstrate the present range of the geothermal investigations. Two introductory contributions address the general problems: V. Vacquier in his paper on the origin of the Earth's internal heat added a gravitational heat source to secular cooling and radiogenic heat producing elements to discuss the whole mantle convection; S. Franck cal-

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culated the thermal and degassing histories to assess the global mean heat flow evolution over the past 4.6 Gyr. Following this introductory part are eight papers presenting newly measured heat flow data together with their interpretation. All of them focus the attention on the tectonically unstable young regions, such as the European Alpine structures, Baikal Rift zone and the Andean subduction zone characterized by a certain transient heat flow component. B. Bodri and L. Rybach present a 2-D thermohydraulic model for the Swiss Alps to show the role of the subsurface fluid circulation in high-relief terrains on the measured high heat flow. M. Fernandez et al. collected over 550 heat flow measurements to construct and discuss the heat flow and heat production maps of the Iberian Peninsula. A. Correia and E. Ramalho reassessed previously published high heat flow for southern Portugal and offer more realistic values. M. Verdoya et al. combined field and laboratory data to study the heat flow–heat production relationship in Corsica. M. Pfister et al. report on the results of an extensive geothermal reconnaissance project in northwestern Anatolia, Turkey. R. Kutas et al. present their geothermal model of the Black Sea depression characterized by an enormous thickness of 14–18 km of sediments with a low to very low heat flow. H. Poort et al. apply a kinematic model of continental extension on the Baikal Rift system estimating the regional differences in the degree of asthenospheric upwarp. M. Springer and A. Foerster present new heat flow density data from Chile and Bolivia and discuss them on the example of the heat-flow profile across the Central Andes.

The comparison of the numerous industrial borehole thermal data with the paleogeothermal conditions in the Canadian Arctic margin enabled to contour heat flow, effective thermal conductivity and geothermal gradient and to assess the thickness of the eroded section (J.A. Majorowicz and A.F. Embry).

The knowledge of the thermophysical properties of the rock material is essential for downward interpretation of near-surface temperature measurements. Similarly important is the experimental information on the distribution of thermal parameters in the very deep continental drillholes. A block of five contributions is introduced by U. Seipold reviewing data on temperature dependence of thermal properties of crystalline rocks combining literature data with his own ample experience. This is followed by two papers presenting data from the superdeep German KTB hole, summarizing experimental high-pressure and high-temperature measurements on KTB-core samples (U. Seipold and E. Huenges), and a theoretical analysis of crustal heat transfer processes at the KTB site using a 2-D inverse method applied to the thermal and hydraulic parameters (H. Lehmann et al.). Thermal properties of the Precambrian basement rocks of the Fennoscandian shield were studied by A. Joehlet and I. Kukkonen. No significant difference was found in the metamorphic temperature, neither any relationship between heat production and P-wave velocity, higher thermal conductivity being related to compositional changes. A detailed thermal conductivity profile from the Vorotilovo deep hole (East European Platform) is discussed by Yu. Popov et al. The calculations show that palaeoclimate may have reduced the observed heat flow up to 25% at a certain depth interval; however, the effect of mass transfer or a non-steady thermal regime should not be excluded.

The latter paper actually turns the attention to the second most important task of contemporary geothermics, namely to the possibility to extract independent information on the past climate changes inverting the near-surface temperature–depth distribution. T. Kohl went back to the German KTB-hole and by forward model analysis and by accounting for advection, topography and lithological heterogeneities concluded that the KTB temperature field was strongly dominated by palaeoclimatic effects dating back as far as the Pleistocene glaciation. Also I. Kukkonen et al. related anomalously low heat flow in eastern Karelia to extremely cold ground temperatures during the last glaciation. The four last contributions present case studies demonstrating the results obtained by the inversion of borehole temperature logs to reconstruct regional ground surface temperature histories of the last several centuries in the Czech Republic (L. Bodri and V. Cermak), Slovenia (D. Rajver et al.), Romania (S. Veliciu and J. Safanda) and in Western Canada (J. Majorowicz and J. Safanda).

The organization of the workshop at Trest and the preparation of this issue were the project of the International Heat Flow Commission. An extremely

positive fact of the meeting was the participation of a number of young colleagues from many countries testifying the general interest of the succeeding new generation.

The editor is indebted to many leading heat flow colleagues who delivered brilliant review presentations during the workshop and managed lively and vivid discussions. Thanks are due to all who contributed to this issue or helped reviewing one or more of the submitted manuscripts. Their comments and suggestions were most helpful in producing this special issue. Sincere thanks for technical and financial support are also due to the International Association of the Seismology and Physics of the Earth Interior and to the Geophysical Institute of the ASCR. Certain financial contributions were provided by the Grant Agency of the Czech Republic through research project No. 205/93/0413 and by the Science and Technology Program between the USA and the Czech Republic funding the international cooperation project No. 02037.

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(Editor and IHFC Chairman)