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Sommario/riassunto

High-pressure flows occur in nature, in industrial processes and in manufactured devices but not in human personal experience which is limited to atmospheric pressure. In nature, high-pressure flows are found in petroleum reservoirs, at ocean depths, and in the atmospheres of planets such as Venus. In industry, the enhanced solubility that occurs at high pressures is used to extract certain chemical species; for example, the solubility of caffeine in supercritical carbon dioxide enables production of decaffeinated coffee and tea. Manufactured devices such as diesel engines and liquid rocket engines operate at pressures well above atmospheric pressure. How mixtures of chemical species behave under high-pressure conditions is described by thermodynamics. However, because thermodynamics cannot describe flows, thermodynamics must be coupled to concepts of motion and transport in order to construct a physical description characterizing all relevant processes in high-pressure flows. The chapters in this book describe observations and modeling of high-pressure flows encountered in aeronautics and astronautics. They have been selected to present the current understanding of high-pressure flows. By editorial intent, agreement between authors on all aspects of the high-pressure field of research was not sought as it was felt that revealing where disagreement exists on specific aspects indicates where the new research opportunities are. Experimental, theoretical and numerical studies are all represented in the chapters. Fundamental investigations are presented first, followed by practical studies.