

## CONTENTS

Preface .....	Okitsugu WATANABE . . . . .	i
<b>Invited Talk</b>		
Development of Japanese mechanical drills—Personal reminiscences		
Yosio SUZUKI .....		1
Deep core drilling in ice		
B. Lyle HANSEN .....		5
<b>Electromechanical Ice Core Drilling</b>		
The new improved version of the ISTUK ice core drill		
Sigfus J. JOHNSEN, Niels S. GUNDESTRUP, Steffen B. HANSEN, Jakob SCHWANDER and Heinrich RUFLI .....		9
Ice coring and drilling technologies developed by the Polar Ice Coring Office		
J. J. KELLEY, K. STANFORD, B. KOCI, M. WUMKES and V. ZAGORODNOV . . . . .		24
Development of the U.S. deep coring ice drill		
M. A. WUMKES .....		41
Operational considerations of the U. S. deep coring ice drill		
M. A. WUMKES .....		52
Future technical developments for the Polar Ice Coring Office 13.2 cm ice coring drill		
Kerry L. STANFORD .....		57
Instrumentation for the PICO deep ice coring drill		
Walter H. HANCOCK .....		69
Technical aspects of deep ice drilling on Law Dome		
V. MORGAN, E. WEHRLE, A. FLEMING, M. RICHARDSON, A. ELCHEIKH and R. BRAND .....		78
BZXJ super light ice core drill		
Guocai ZHU and JianKang HAN .....		87
Electromechanical drilling of a 300-m core in a dry hole at Summit, Greenland		
Jakob SCHWANDER and Heinrich RUFLI .....		93
Low power diamond rock coring parameters		
Zhengwen WANG, Jesse COLLINS and Scott L. HUANG .....		99
Development of a JARE deep ice core drill system		
Yoichi TANAKA, Akiyoshi TAKAHASHI, Yoshiyuki FUJII, Hideki NARITA, Kunio SHINBORI, Nobuhiko AZUMA and Okitsugu WATANABE . . . . .		113

An experiment on ice cutting under high liquid pressure and low temperature Hideki NARITA, Kunio SHINBORI and Yuji KODAMA .....	124
Investigation of the ice cutting process by the rotary drill N. I. VASILIEV and P. G. TALALAY .....	132
KEMS-112 electromechanical ice core drill B. B. KUDRYASHOV, N. I. VASILIEV and P. G. TALALAY .....	138
<b>Thermal Ice Core Drilling</b>	
Drilling of glacier boreholes with a hydrophilic liquid V. S. ZAGORODNOV, J. J. KELLEY and O. V. NAGORNOV .....	153
Directional drilling V. S. ZAGORODNOV, J. J. KELLEY and B. R. KOCHI .....	165
Thermal ice core drilling to 700 m depth at Mizuho Station, East Antarctica Hideki NARITA, Yoshiyuki FUJII, Yoshiki NAKAYAMA, Kunio KAWADA and Akiyoshi TAKAHASHI .....	172
Equipment and methods of microbiological sampling from deep levels of ice in central Antarctica N. E. BOBIN, B. B. KUDRYASHOV, V. M. PASHKEVITCH, S. S. ABYZOV and I. N. MITSKEVITCH .....	184
<b>Non-Ice Producing Drilling</b>	
BAS hot water drilling on Ronne Ice Shelf, Antarctica Keith MAKINSON .....	192
The AMANDA Project: Drilling precise, large-diameter holes using hot water Bruce KOCHI .....	203
Borehole drilling for sewage disposal at Asuka Station, East Antarctica Kenji ISHIZAWA and Akiyoshi TAKAHASHI .....	212
<b>Borehole Measurements</b>	
A new short borehole logging tool B. Lyle HANSEN and John R. KELTY .....	218
The UCPH borehole logger Niels S. GUNDESTRUP, Henrik B. CLAUSEN and B. Lyle HANSEN .....	224
Vertical strain measurement in core holes C. F. RAYMOND, J. C. ROGERS, P. L. TAYLOR and B. KOCHI .....	234
Borehole logging device at Dome F, Antarctica Renji NARUSE, Kunio SHINBORI, Nobuhiko AZUMA, Hideharu SAITO and Masaki NAGATUKA .....	241

<b>Behavior of a deep hole drilled in ice at Vostok Station</b>	
V. K. TCHISTIAKOV, A. KRACILEV, V. Ya. LIPENKOV, J. Ph. BALESTRIERI, C. RADO and J. R. PETIT .....	247
<b>Thermal modeling of ice cores and boreholes via the finite element technique</b>	
Debendra K. DAS and S. Srikanta JOIS .....	256
<b>Ice Core Processing</b>	
Continuous study of an ice core: ECM, fine stratigraphy, air bubbles and crystals	
V. ZAGORODNOV, J. J. KELLEY, L. THOMPSON and Okitsugu WATANABE .....	281
<b>Ice core processing at Dome F, Antarctica</b>	
Hitoshi SHOJI, Hideki NARITA, Yoshiyuki FUJII, Kokichi KAMIYAMA and Nobuhiko AZUMA .....	291
<b>Ice Core Quality</b>	
Brittle zone and air-hydrate formation in polar ice sheets	
Tsutomu UCHIDA, Paul DUVAL, Volodya Ya. LIPENKOV, Takeo HONDOH, Shinji MAE and Hitoshi SHOJI .....	298
Optimized storage condition of deep ice core samples from the viewpoint of air-hydrate analysis	
Tsutomu UCHIDA, Takeo HONDOH, Shinji MAE, Hitoshi SHOJI and Nobuhiko AZUMA .....	306
Effect of a heated drilling bit and borehole liquid on thermoelastic stresses in an ice core	
O. V. NAGORNOV, V. S. ZAGORODNOV and J. J. KELLEY .....	314
<b>Borehole Liquid</b>	
Hole liquids and gaskets for the ISTUK deep ice core drill	
Niels S. GUNDESTRUP, Henrik B. CLAUSEN, Steffen B. HANSEN and Sigfus J. JOHNSEN .....	327
Fluids for use in deep ice-core drilling	
T. A. GOSINK, J. J. KELLEY, M. A. TUMEY, B. KOCH, K. STANFORD, V. ZAGORODNOV and G. EHLERT .....	335
Drilling fluid for Dome F Project in Antarctica	
Shuji FUJITA, Tomomi YAMADA, Renji NARUSE, Shinji MAE, Nobuhiko AZUMA and Yoshiyuki FUJII .....	347
<b>Drill Camp Operation and Logistics</b>	
The GRIP deep drilling camp	
Niels S. GUNDESTRUP, Jørgen P. STEFFENSEN and Jakob SCHWANDER .....	358
The Guliya Ice Cap, China: Retrieval and return of a 308-m ice core from 6200 m altitude	
Bruce KOCH and V. ZAGORODNOV .....	371

Rapid deployment of camp facilities utilizing point-supported structures Victor B. MIMKEN and Kevin C. CURTIS . . . . .	377
Plan of Dome-F Station for deep ice-coring by the Japanese Antarctic Research Expedition (JARE) Shuhei TAKAHASHI and Nobuhiko AZUMA . . . . .	386
<b>Special Session</b>	
Report 1. Status of drilling plan . . . . .	396
Report 2. Status of shallow drill . . . . .	400
Report 3. Status of deep drill . . . . .	401
Report 4. Methods of maintaining a vertical borehole . . . . .	403
Report 5. Status of core quality . . . . .	405
Report 6. Status of borehole liquid . . . . .	406
Author index . . . . .	408