

Acknowledgements

I wish to express my profound gratitude to Dr. S.K. Gupta for introducing me to the exciting subject of hydrology. I am pleased to acknowledge that whatever understanding of hydrological systems that I have developed today, is largely because of my scientific interaction over the last fifteen years of my association with him. He taught me not only the isotope hydrology but various other conventional and modern hydrological aspects related to water resource development and management. I thank him not only for guiding me throughout the Ph.D. work but for transforming me into an explorer of the hydrological changes induced by global climate change and engineered structures.

I thank Dr. Satish Patel of the M.S. University of Baroda for agreeing to be co-guide of this thesis. His untiring help in guiding me and his encouragement and cooperation in various scientific and administrative issues have been of immense value.

Dr. P. Sharma took a lot of pains in editing the entire manuscript to improve its linguistic as well as scientific presentation. I sincerely thank him for his kindness not only during my studies but throughout my association with him.

The aspects of stable isotope systematics taught by Prof. R. Ramesh during my pre-doctoral coursework at Physical Research Laboratory (PRL) and by Prof. S.K. Bhattacharya during informal discussions helped me considerably in understanding water isotope systematics. I sincerely thank both of them for educating me. Discussions with Prof. R. Ramesh also motivated me to read the basic physics enabling me to visualise not only the large scale geohydrological processes from a hydrologic perspective but also atomic and molecular scale processes from a perspective of physics.

Prof. S. Krishnaswami has been a source of continuous inspiration and encouragement, particularly during setting up of the CFC laboratory. I have greatly benefited from informal yet very informative and enlightening discussions with him. I sincerely thank him for all that he did for me. It was indeed due to him that I could visit some of the distinguished scientists, namely, Prof. Peter S. Liss and Dr. P. Dennis (University of East Anglia, Norwich); Dr. T. C. Atkinson and Dr. Yuan Zhao (University College, London); and Dr. W. G. Darling and Dr. D.C. Goody (Institute of Hydrology, British Geological Survey, Wallingford). Interactions with these researchers significantly improved my perspective about application of tracer techniques to hydrology. I thank them all for their guidance.

Dr. Ed. Busenberg and Dr. J. Cassile of the Reston CFC laboratory, US Geological Survey responded to a large number of my emails despite the fact that I never met them. They provided some critical inputs while setting up the CFC laboratory. I sincerely thank both of them.

I also thank Prof. Shyam Lal, Mr. S. Venkataramani and Mr. T.K. Sunilkumar for providing important guidance and help during initial stages of setting up the CFC laboratory.

Inputs from Prof. M.M. Sarin about the chemistry of ground waters and the dry deposition of salt and dust particles have been useful in formulating some of the interpretations of the data presented in this thesis. I thank him for his help.

Informal interaction with Prof. A.K. Singhvi inspired me to organise the laboratory as well as to manage the field trips efficiently. I thank him for his encouraging words of advice. Prof. S.V.S. Murty responded positively every time I approached him with some request concerning logistics. I also thank him for his kind cooperation.

Mr. M.H. Patel (PRL) and Mr B.R. Raval (GWRDC) helped me in the fieldwork and in mobilising the support of local people for permission to work in their farms. Mr. D.K. Rao and Mr. R.A. Jani helped significantly in isotopic analyses of water samples. Dr. Meetu Agarwal, then a PDF in hydrology group assisted me in the fieldwork and also analysed the groundwater samples for the ^{222}Rn activity. My former colleague Mrs. Vasanti Somayajulu helped me in analysing some of the samples and in other laboratory activities. I thank them all for their great help.

Mr. Pranav Adhyaru set up the automated electronic system for remotely actuating the Valco Rotary Valves coupled with External Event Control Card of the Gas Chromatograph. Dr. M.G. Yadava measured the ^{14}C activity in the carbonate precipitates provided to him. Dr. Navin Juyal has been a valuable resource person for geological and palaeoclimatic aspects of the study area. I sincerely thank all of them for their very important contributions.

I would also like to thank Mr. Y.M Trivedi, Mr. K.K. Patel, Mrs. Parulben and Mr. Ghanshyambhai for extending the necessary administrative and logistic support during several field trips. My thanks are also due to Mr. D.R. Ranpura who took the photographs for this thesis.

I can not imagine how the life at PRL would be without Tea club members, namely V.G. Shah, Pandian, Shiva, Padia, Ramakant, Hitesh, Renga, Kamesh, Jani, Madhusudan and Pranav. The ten minutes intermission spent in their company provided a refreshing change in my hectic work schedule. I am happy to acknowledge a large number of my friends and colleagues, namely Anil, Amish, Bhas, Bhushan, Bobra, Deepu, Dilip Angom, GG Dholakia, AP Gohil, RS Gupta, Ishwarbhai, Jitesh Bhatt, Jyoti, Jigar, KK Patel, Pauline, Modh, Narayanan, Nishthaben, Rama, Raghu, Sunil, Subbu, SK Shah, Somkumar, Suthar and Vishal for their constant encouragement and support. I sincerely thank all of them for being with me.

There are colleagues at PRL too numerous to be named individually for their direct or indirect help during this work. I do remember all of them and express my sincere gratitude.

The encouragement from my family has been the motivating force to sustain me through the difficult times during this work. I thank all the members of my extended family at Baroda, Gandhinagar and Ahmedabad for excusing me for not being with them when they needed me the most.

I have no words to thank my son -Amol and my wife -Uma. Their lonely evenings and weekends are hidden throughout this thesis.

-R.D. Deshpande