

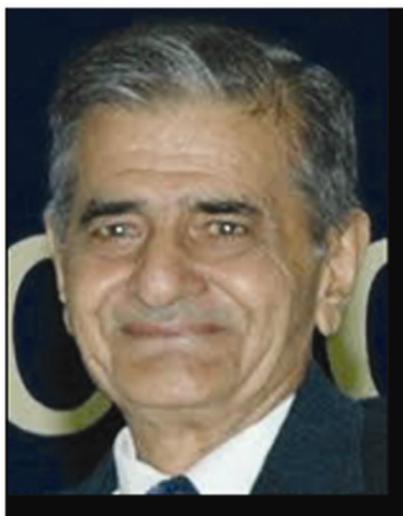
## D. R. Sikka (1932–2017)

D. R. Sikka's passionate affair with the Indian summer monsoon (as he called it) began in 1954, when he joined the India Meteorological Department (IMD), and ceased only with the end of his life on 18 March 2017.

Sikka's enormous contributions to our understanding and predicting the monsoon were rooted in his insatiable urge to delve deep into the monsoon system and its ever-varying manifestations. To this end he combined analysis of observations with interpretation in the framework of the latest advances in tropical meteorology, which he was always aware of because of his genuine scholarship. Of his discoveries, the two most important ones, which have received worldwide recognition, are (i) important facets of the sub-seasonal variation of the monsoon revealed by analysis of daily satellite imagery, such as the association of the large scale rainfall over the Indian monsoon zone with the northward propagation of cloud-bands generated over the warm waters of the equatorial Indian Ocean at intervals of 2–6 weeks throughout the summer monsoon season, and (ii) the link between the Indian summer monsoon rainfall and the El Niño Southern Oscillation (ENSO) phenomenon over the Pacific (with a high propensity of droughts during El Niño) revealed by meticulous analysis of the monsoon rainfall data series developed by scientists at the Indian Institute of Tropical Meteorology (IITM) and a set of indices for ENSO which were then being developed. Both these discoveries have had a large impact on the research in the decades following their publication in 1980. Even today, the ENSO-monsoon relationship is the basis of monsoon prediction by most of the state-of-art dynamical models.

To make advances in understanding complex systems such as the monsoon, a multi-pronged approach incorporating an analysis of regularly collected observations of the atmosphere and oceans, of data collected in special observational experiments/campaigns focused on a few important phenomena/facets and theoretical studies with models to unravel the underlying mechanisms has to be adopted. Sikka actively participated in all the major international observational experiments in the region beginning with the International Indian Ocean Expedi-

tion (IIOE, 1963–66). Several Indian scientists participating in IIOE, such as Sikka and P. V. Joseph, made valuable contributions to monsoon studies in the following decades. IIOE was followed by other international experiments in 1973, 1977 and by the International Summer Monsoon Experiment (SMONEX, 1979).



About the SMONEX experience, Sikka remarked: 'the Indian scientists participating in the SMONEX remained on the periphery as they were not well prepared for research studies and hence much of the credit of the excellent monsoon research emerging out of SMONEX went to the US scientists; clearly, it is essential for India to build its own capabilities for launching field programmes.' Such capabilities were built up with the establishment of Centres for Atmospheric Science at the Indian Institute of Science (IISc), Bengaluru and IIT, Delhi in the early 80s and with the vigorous training programmes at the National Institute of Oceanography, Goa and Naval Physical Oceanographic Laboratory, Kochi. Sikka played an important role in nurturing the research and training in atmospheric and oceanic sciences in the country at various institutions. He collaborated with scientists from IISc in planning and conducting the Monsoon Trough Boundary Layer Experiment in 1989–90. His dream of major observational experiments for studying the variability of the Indian summer monsoon, planned and conducted totally by Indian scientists, was realized when the Indian Climate Re-

search Programme (ICRP) was launched in 1995. Under the ICRP, special observational experiments over the Bay of Bengal, Arabian Sea and the Indian monsoon zone were planned and successfully conducted by scientists from different institutions in the country. Sikka played a key role in the planning and implementation of ICRP. His deep interest in all facets of the atmosphere–ocean system was an important factor in motivating a large number of young scientists in addressing the challenging problems and his appreciation and criticism of the results, contributed to the success of all the observational experiments. Sikka was widely respected and regarded as *Bhishmapitamah* of our field.

Before considering Sikka's moulding as an extraordinary scientist and his contributions to the meteorological institutions in the country, it is interesting to recount the circumstances in his childhood and youth which shaped Sikka, the man. He was born in 1932, and spent his early childhood in Jhang Mighiana, then in undivided India, now in Pakistan. His father, a matriculate, joined the railway service as a booking clerk in 1910 but his mother completed only the fifth standard in Punjabi in Gurumukhi medium, as this was the highest standard which girls could reach in that region in that era. His academic performance was rated excellent in the first years in the Urdu-medium municipal primary school as well as the high school from which he graduated with Urdu and Persian. Access to the excellent school library kindled his love for reading Urdu fiction and he developed the reading habit, which later made him a genuine scholar in the field, with a vast knowledge of the works of the early pioneers such as Blanford and Elliot as well of modern literature.

Sikka had started participating in the freedom struggle right from 1942. However, freedom led to enormous hardship for his family as they were evicted from Pakistan and had to literally walk a large part of the distance to the Indian border, in the middle of a long caravan escorted by jawans of the Gurkha regiment. During the journey, they could see dead bodies scattered in the bushes along the side of the path and corpses floating in the canal water. Finally, they could get into a train which brought them to the Indian

territory, where they became a part of a refugee camp. Eventually a relative, who was a railway guard at Panipat, found them and they settled in Panipat where Sikka was admitted to 10th standard in March 1948. It speaks volumes of his intelligence and strength of character, that despite this traumatic experience, after studying the entire syllabus for the matriculation examination in just four months that remained until July, he got first division with 70%, i.e. very high marks in that era. He then studied in a college in Kanpur where his brother had a job, with fees being waived because of his excellent performance. While studying for his B Sc, he had become very much interested in chemistry and joined for M Sc in Physical Chemistry in the famous Christ Church College in Kanpur. He completed his M Sc in 1954 with a first rank in the subject in Agra University.

Since his ambition after M Sc was to become a college teacher, he applied for a teaching job in at least 50 colleges spread over Himachal Pradesh, Haryana, Punjab and Western Uttar Pradesh and appeared for interview in dozens of them, but with no success. Fortunately, even before he got his M Sc results, he had registered in Employment Exchange, Kanpur with B Sc as his qualification. This helped him get an interview call for the post of a Scientific Assistant (at that time considered as higher technical job) in IMD. This interview held in mid-June 1954 was, in his view, perhaps the toughest job interview he ever faced. The board consisted of the then Director General of Observatories with his two Deputy Director Generals and the interview lasted for nearly half an hour. He must have done well and was selected for the post in IMD. Thus began his tryst with the monsoon.

He was fortunate to have his first post-graduate under another great monsoon meteorologist,

R Anathkrishnan, and got excellent training in making careful observations with all the meteorological instruments including pilot balloons and radiosondes and later on in identifying errors in the radisonde temperature and filtering out data that were of doubtful quality. He learnt about many important features of the upper atmosphere such as the reversal of upper tropospheric winds at Jodhpur from winter–spring season to monsoon season and the presence of moist air up to 5 km on active monsoon days in the monsoon season, directly from these observations. He also learnt to read weather charts and acquired expertise in synoptic meteorology.

Sikka joined IITM in December 1962, because he wanted to devote himself to research. His active participation in IIOE soon thereafter, involved interaction with some of the best scientists in the field and significantly contributed to his development as a meteorologist. After that, he was sent to US where he was trained in satellite meteorology as well as numerical weather prediction (NWP). Thus, in addition to synoptic meteorology, Sikka got a good background in dynamical meteorology and the fast developing branches of NWP and satellite meteorology. Since the work in NWP had just started in India, at IITM, he worked on the use of dynamical models for weather and tropical cyclone prediction and adoption of objective analysis techniques. He also developed methods for prediction of tropical cyclones based on historical data and carried out monsoon studies and studies of satellite derived cloud clusters. I started collaborating with him on studies of the subseasonal variation of the monsoon when I joined IITM as a CSIR pool officer in 1971 and monsoon studies became the major focus of his work thereafter. Since we shared a deep interest in the monsoon and brought different expertise to the table, this proved to be

the beginning of a long lasting successful collaboration not only in research, which provided new insights into the monsoon, but also in planning and executing important national programmes such as the ICRP.

Sikka played an important role in nurturing a high level of research at IITM despite a rather unfavourable atmosphere. He became the director in 1986 and worked towards improving the working environment, building up a world-class library, organizing national and international symposia and promoting interactions with top-level scientists from within and outside the country. Being recognized the world over as the monsoon expert, he was invited to participate in many international programmes and symposia. He continued to work at the same pace after retiring and made significant contributions to build up the meteorological institutions in the country. For example, for the Ministry of Earth Sciences, he worked as the Chairman of a Committee on the Modernization of the Observational Systems in IMD and prepared a detailed roadmap for this important development.

Sikka's contributions have been recognized with several awards. He was elected a fellow of the Indian Academy of Sciences in 1984, was given the very first Lifetime Achievement Award in Atmospheric Science and Technology by the Ministry of Earth Sciences in 2007, Sir Gilbert Thomas Walker Gold Medal in 2012 and Lifetime achievement award in 2017 by the India Meteorological Society. He is survived by two daughters and a granddaughter.

SULOCHANA GADGIL

*A-18, Spring Flowers,  
Panchavati, Pashan,  
Pune 411 008, India  
e-mail: sulugadgil@gmail.com*