Curriculum Vitae

Dr. Srinivas Bikkina
Post Doctoral Fellow
Dept. of Applied Environmental Sciences
Bolin Center for Climate Research
Stockholm University
Stockholm, Sweden
Contact No: +46 700961828
E-mail: srinivas.prl@gmail.com
Srinivas.Bikkina@itm.su.se

Personal Profile:
Date of Birth: 15 – 05 -1984
Nationality: Indian

Academic profile:

Degree	Major Subjects	Board/University	Class	% Marks
Ph.D.	Air-Sea exchange	Mohanlal Sukhadia University, Udaipur	-	-
M.Sc.	Marine Chemistry	Andhra University, Visakhapatnam	First	68
B.Sc.	M.P.C.,	Andhra University, Visakhapatnam	First	78
Intermediate	M.P.C.,	Board of Intermediate Education, Andhra Pradesh	First	87
S.S.C	-	Board of Secondary Education, Andhra Pradesh	First	78

Work Experience: Post Doctoral Fellow at Stockholm University, Sweden (Sept, 2014 – till now)

Previous position: Post Doctoral Fellow (Sept,2013 – Sept, 2014) at Hokkaido University, Japan

Post Doctoral Fellow (July, 2012 – Aug, 2013) at Physical Research Laboratory (PRL), India

Broad area of research: Organic aerosols – transport-impacts.
Air-sea exchange of nutrients and trace metals.

Ph.D. title: "Atmospheric deposition of N, P and Fe to the Northern Indian Ocean". Thesis work was conducted in the PRL and Ph.D. degree is obtained from Mohanlal Sukhadia University, Udaipur, India (July, 2007- March, 2012).

Research Outcome: The continental outflow from south and south-east Asia to the Northern Indian Ocean is a conspicuous seasonal feature during the late NE-monsoon (January-April) [*Kumar et al.*, 2010; *Sarin et al.*, 2010]. The prime focus of my research work is to assess the spatiotemporal variability (if any) in the atmospheric abundances of chemical constituents over the Bay of Bengal (BoB) and the Arabian Sea (ARS) during NE-monsoon. In particular, I have focused on the atmospheric transport and air-sea deposition of nutrients (N, P and Fe), their fixation rates in the surface waters by marine phytoplankton and their contribution to insitu primary productivity (PP).

Relatively high concentrations and, therefore, dry-deposition fluxes of water-soluble nutrients (NO_3^-, NH_4^+, N_{Org}, P_{Inorg} and Fe_{ws}) were observed over the BoB (N_{Tot}, P_{Inorg} and Fe_{ws} are 2-167, 0.5-4.8 and 0.02-1.2 µmol m^{-2} d^{-1}, respectively) compared to those over the ARS (N_{Tot} and P_{Inorg}: 0.2–18.6 and 0.3-0.9 µmol m^{-2} d^{-1}, respectively; Fe_{ws}: 0.7-15.3 nmol m^{-2} d^{-1}). These differences mainly arise due to the predominance of anthropogenic sources over the former oceanic basin [*Srinivas and Sarin*, 2013a]. The concentration of inorganic nitrogen (i.e., N_{Inorg}: occur mainly as NH_4^+-N over the BoB and NO_3^--N over the ARS) dominates (> 80 %) the total soluble nitrogen (N_{Tot} = N_{Inorg}+N_{Org}). However, deposition of soluble organic nitrogen (N_{Org}) near the coastal regions can be significant as projected by the models [*Srinivas et al.*, 2011b]. Higher concentrations of soluble inorganic phosphorus (P_{Inorg}) over the BoB and its significant linear correlations with water-soluble non-sea-salt-K^+ (a proxy for biomass combustion source), OC and EC, indicate the contribution of this

macronutrient from post-harvest crop residue/wood fuel burning emissions in the Indo-Gangetic Plain (IGP) [*Srinivas and Sarin*, 2012]. In contrast, P_{Inorg} concentration over the ARS is about 4 to 5 times lower and is primarily associated with the mineral dust from the surrounding desert regions (viz., Thar, Arab and Iran etc.,) [*Srinivas and Sarin*, 2012]. The fractional solubility of aerosol-Fe (i.e., defined as $Fe_{ws}(\%) = Fe_{ws} / Fe_{Tot}*100$; where Fe_{ws} and Fe_{Tot} refer to water-soluble and total aerosol iron, respectively) over the BoB and the ARS varied from 1.4-24% and 0.02-0.4%, respectively [*Srinivas et al.*, 2011a]. The large variability in $Fe_{ws}(\%)$ over the BoB is attributed to the type of mineral dust and contribution from combustion sources. The air-sea deposition of N and P over both marine basins (BoB and ARS) is of comparable magnitude with their supply via rivers. The high enrichment factors of Pb, Cd and Cu over the BoB reemphasize the dominance of anthropogenic sources [*Srinivas and Sarin*, 2013b]. The characteristic source/transport signatures of nutrients in marine aerosols over the BoB is also consistent with $PM_{2.5}$ (fine particles < 2.5 μm) sampled from the IGP-outflow to the BoB during Nov'2009-Mar'2010 [*Srinivas et al.*, 2014a; *Srinivas and Sarin*, 2015; *Srinivas et al.*, 2014b].

Apart from the nutrients, I have also investigated the role of light absorbing organic aerosols (so called brown carbon, a recently recognized absorbing carbonaceous aerosol after soot) in the continental outflow to the BoB [*Srinivas and Sarin*, 2014a]. These light absorbing organic aerosols have been documented for the first time over the Northern Indian Ocean, suggesting the need for reassessment of regional radiative forcing of carbonaceous aerosols [*Srinivas and Sarin*, 2013c]. In addition, a novel mass-closure approach has been proposed to derive the particulate organic carbon (OC) to organic matter conversion factors from the measured chemical composition of $PM_{2.5}$ in the IGP-outflow to the BoB [*Srinivas and Sarin*, 2014b]. This is in contrast with extensive literature studies over South Asia that rely solely on the assumptions.

Cruise Participation:

1) As a part of my dissertation work after M.Sc., I've participated in a multi-disciplinary oceanographic cruise with National Institute of Oceanography (SK-227, onboard ORV Sagar Kanya) to Equatorial Indian Ocean in August'2006.

2) As a part of GEOTRACES, I've participated in cruise (SS-259) onboard FORV Sagar Sampada to Arabian Sea and Bay of Bengal for the collection and analysis of aerosol samples.

3) As a part of national programme, Integrated Campaign of Aerosols, trace gases and Radiation Budget (Winter- ICARB), I've participated in a cruise (no: SK-254) onboard ORV Sagar Kanya for the collection and analysis of aerosol samples over the Bay of Bengal during January'2009.

Workshops/Courses attended:

1) Course work including following courses: (a) Physics and Chemistry of Solar system, (b) Nuclear Physics, (c) Mathematical and Statistical Methods, and (d) Isotope Geochemistry, for research students at Physical Research Laboratory during 2007-2008.
2) International Symposium on Aerosol-Chemistry-Climate Interactions – 2007, Ahmedabad, India.
3) Attended a SERC school on "Atmospheric and Space Sciences" held at Department of Physics, Andhra University in September'2008.
4) Participated in a 5th International SOLAS (Surface Ocean –Lower Atmospheric Study) SUMMER SCHOOL, held at Cargese, Corsica, France during 29th August-10th September, 2011.
5) Participated in a GEOTRACES workshop on "Stable isotopes of biologically important trace metals, held at Imperial College, London, UK during 13-14 September, 2012.

Scholarships/Awards:

1) Research scholarship at Physical Research Laboratory, Ahmedabad (2007 onwards).

2) Poster Presentation Award in a "5th International symposium on Biological and Environmental chemistry of DMS (P) and Related compounds" held at the National Institute of Oceanography, Goa during 19-22nd October, 2010.
3) Full funded travel award grant provided for attending UK first international GEOTRACES workshop.

Publications

Peer-reviewed:

1) **Srinivas Bikkina,** Kimitaka Kawamura, and Manmohan Sarin, 2016. Stable carbon and nitrogen isotopic composition of fine mode aerosols (PM2.5) over the Bay of Bengal: impact of continental sources, ***Tellus B***, doi: 10.3402/tellusb.v68.31518 (IF = 2.402)

2) **Srinivas Bikkina**, August Andersson, M. M. Sarin, R. J. Sheesley, E. Kirillova, R. Rengarajan, A. K. Sudheer, K. Ram, and Örjan Gustafsson, 2016. Dual carbon isotope characterization of total organic carbon in wintertime carbonaceous aerosols from northern India, ***Journal of Geophysical Research,*** doi: 10.1002/2016JD024880 (IF = 3.426).

3) **Srinivas Bikkina,** M.M. Sarin, Venkatesh Chinni, 2015. Atmospheric ^{210}Pb and anthropogenic trace metals in the continental outflow to the Bay of Bengal, ***Atmospheric Environment***, in press, doi: doi:10.1016/j.atmosenv.2015.10.044 (IF = 3.281).

4) **Srinivas Bikkina**, Neeraj Rastogi, M.M. Sarin, Atinderpal Singh, and Darshan Singh, 2015. Mass absorption efficiency of light absorbing organic aerosols from source region of paddy-residue burning emissions in the Indo-Gangetic Plain, ***Atmospheric Environment***, in press, doi: 10.1016/j.atmosenv.2015.07.017 (IF = 3.281).

5) **Srinivas Bikkina**, Kawamura, K., and Miyazaki, Y., 2015, Latitudinal distributions of atmospheric dicarboxylic acids, oxocarboxylic acids and α-dicarbonyls over the western North Pacific: Sources and formation pathways, ***Journal of Geophysical Research***, 120, doi:10.1002/2014JD022235 (IF = 3.426).

6) **Srinivas Bikkina**, Kawamura, K., Imanishi, K., Boreddy, S.K.R., and Nojiri, Y., 2015, Seasonal and longitudinal distributions of atmospheric water-soluble dicarboxylic acids, oxocarboxylic acids and α-dicarbonyls over the North Pacific, ***Journal of Geophysical Research***, doi: 10.1002/2014JD022972 (IF = 3.426).

7) **Srinivas Bikkina** and M. M. Sarin, 2015, "Atmospheric supply of phosphorous to the Northern Indian Ocean, ***"Current Science"***, Special section on sustainable phosphorous management, Vol. 108, No. 7, 1300-1305 (IF = 0.926)

8) **Srinivas Bikkina,** Kimitaka Kawamura, Yuzo Miyazaki and Pingqing Fu, 2014 "High abundances of oxalic, azelaic, and glyoxylic acids and methylglyoxal in the open ocean with high biological activity: Implication for secondary OA formation from isoprene", ***Geophysical Research Letters***, doi: doi:10.1002/2014GL059913 **(**IF = 4.196**).**

9) **Srinivas Bikkina,** M. M. Sarin and R. Rengarajan, "Atmospheric transport of mineral dust from the Indo-Gangetic Plain: Temporal variability, acid processing, and iron solubility", "***Geochemistry Geophysics Geosystems***", doi: 10.1002/2014GC005395 **(**IF = 2.923**).**

10) **Srinivas Bikkina,** M. M. Sarin, and V.V.S.S. Sarma, 2014, "Atmospheric outflow of nutrients to the Bay of Bengal: Impact of anthropogenic sources", ***Journal of Marine Systems***, doi: 10.1016/j.jmarsys.2014.07.008, **(**IF = 2.508**).**

11) **Srinivas Bikkina** and M. M. Sarin, "$PM_{2.5}$, EC and OC in atmospheric outflow from the Indo-Gangetic Plain: Temporal variability and aerosol organic carbon-to-organic mass conversion factor", ***"Science of the Total Environment"***, 487, 196 -205, doi: 10.1016/j.scitotenv.2014.04.002 (IF = 4.099).

12) **Srinivas Bikkina** and M.M. Sarin, 2014, "Brown carbon in atmospheric outflow from the Indo-Gangetic Plain: Mass absorption efficiency and temporal variability", ***Atmospheric Environment,*** 89, doi: 10.1016/j.atmosenv.2014.03.030 (IF = 3.281)

13) **Srinivas Bikkina** and M. M. Sarin, 2013, "Light absorbing organic aerosols (brown carbon) over the tropical Indian Ocean: Impact of biomass burning emissions", ***Environmental Research Letters***. 8, doi:10.1088/1748-9326/8/4/044042 (IF = 3.906).

14) **Srinivas Bikkina** and M. M. Sarin, 2013, "Atmospheric deposition of N, P and Fe to the Northern Indian Ocean: Implications to C- and N- fixation, ***Science of the Total Environment,*** 456-457, 104–114, doi: 10.1016/j.scitotenv.2013.03.068 (IF = 4.099).

15) **Srinivas Bikkina** and M. M. Sarin 2013, "Atmospheric dry-deposition of mineral dust and anthropogenic trace metals to the Bay of Bengal", ***Journal of Marine Systems***, 126, 56–68, doi:10.1016/j.jmarsys.2012.11.004 (IF = 2.508).

16) **Srinivas Bikkina** and M. M. Sarin, 2012, "Atmospheric pathways of Phosphorous to the Bay of Bengal: Contribution from anthropogenic sources and mineral dust, ***Tellus B,*** **doi:**10.3402/tellusb.v64i0.17174 (IF = 2.402).

17) **Srinivas Bikkina,** M. M. Sarin and V.V.S.S. Sarma, 2011, "Atmospheric Deposition of Inorganic and Organic Nitrogen to the Bay of Bengal: Impact of continental outflow", ***Marine Chemistry***, 127, 170-179 doi:10.1016/j.marchem.2011.09.002 (IF = 2.735).

18) **Srinivas Bikkina**, M. M. Sarin and Ashwini Kumar, 2011, "Impact of anthropogenic sources on aerosol iron solubility over the Bay of Bengal and the Arabian Sea", ***Biogeochemistry***, doi: 10.1007/s10533-011-9680-1 (IF = 3.488).

19) **Srinivas Bikkina**, M. M. Sarin, Ashwini Kumar and A. K. Sudheer, 2011, "Impact of continental outflow on chemistry of atmospheric aerosols over tropical Bay of Bengal", ***Atmos. Chem. Phys. Discuss***., 11, 20667–20711, 2011.

20) Ashwini Kumar, M.M.Sarin, **Srinivas Bikkina**, (2010) "Aerosol iron solubility over Bay of Bengal: Role of anthropogenic sources and chemical processing", ***Marine Chemistry***, doi:10.1016/j.marchem.2010.04.005 (IF = 2.735).

21) M. M. Sarin, Ashwini Kumar, **Srinivas Bikkina**, A. K. Sudheer and N. Rastogi, 2011, "Anthropogenic sulphate aerosols and large Cl-deficit in marine atmospheric boundary layer of tropical Bay of Bengal, "***Journal of Atmospheric Chemistry***", 66, 1-2, pp 1-10, doi: 10.1007/s10874-011-9188-z (**IF = 1.950**).

22) Boreddy, S. K. R., K. Kawamura, **Srinivas Bikkina**, and M. M. Sarin (2016), Hygroscopic growth of particles nebulized from water-soluble extracts of PM2.5 aerosols over the Bay of Bengal: Influence of heterogeneity in air masses and formation pathways, Science of The Total Environment, 544, 661-669, doi:10.1016/j.scitotenv.2015.11.164 (**IF = 4.099).**

Review articles/newsletters:

23) Kimitaka Kawamura and **Srinivas Bikkina,** 2015. "A review of dicarboxylic acids and related compounds in atmospheric aerosols: Molecular distributions, sources and transformation", ***Atmospheric Research***, accepted, doi: 10.1016/j.atmosres.2015.11.018 **(Invited Review Article).**, (**IF = 2.844**)

24) R. Rengarajan, **Srinivas Bikkina,** and M.M. Sarin, (2010), "Atmospheric deposition of reactive nitrogen over continental sites and oceanic regions of India: A review". Proceedings of 5th International Nitrogen conference (N -2010), ISBN: 81-85992-17-7 **(Invited Review Article)**.

25) Ashwini Kumar, M.M.Sarin, **Srinivas Bikkina**, A. K. Sudheer and N. Rastogi, (2010), "Mineral dust and anthropogenic trace element inputs to the Bay of Bengal", issue 10, pp: 8-9, SOLAS newsletter.

International Symposia/Conference:

1) **Srinivas Bikkina**, M.M. Sarin, Ashwini Kumar and R. Rengarajan, "Atmospheric dry deposition of N, P, and Fe to the Bay of Bengal", Asia Oceania Geosciences Society-2010, 5-9 'July, Hyderabad, India.

2) Ashwini Kumar, M.M.Sarin, **Srinivas Bikkina**, A.K. Sudheer, and N. Rastogi, "Large-scale chloride-depletion in sea-salt aerosols over Bay of Bengal: Implications to climate forcing" Asia Oceania Geosciences Society-2010, 5-9 'July, Hyderabad, India.

3) **Srinivas Bikkina**, M. M. Sarin, A. Kumar, "Impact of anthropogenic sources on iron mobilization from mineral aerosols", 5th International symposium on biological and environmental chemistry DMS (P) and related compounds 19-22nd October'2010, Goa, India.

4) M. M. Sarin and **Srinivas Bikkina**, "Toxic metals and chloride depletion in marine aerosols over tropical Bay of Bengal: Impact of continental outflow", 5th International symposium on biological and environmental chemistry DMS (P) and related compounds, 19-22nd October 2010, Goa, India.

5) M. M. Sarin and **Srinivas Bikkina**, "Impact of Continental outflow on atmospheric dry-deposition of N, P and Fe to the Bay of Bengal", 7th International conference on Asian Marine Geology, Session VII, 11-14th October 2011, Goa, India.

6) **Srinivas Bikkina**, M.M. Sarin and A. Kumar (2010), Impact of anthropogenic sources on chemical composition of aerosols over Bay of Bengal., paper presented at IASTA Symposium (ISSN 0971-4570), Vol. 19, No 1&2, March.

7) **Srinivas Bikkina** and M. M. Sarin, (2012), Chemical Characterization of atmospheric outflow to the Bay of Bengal, paper presented at IASTA symposium (ISSN 0971-4570), December 11-13.

8) **Srinivas Bikkina** & M. M. Sarin, (2013), Chemical fingerprinting of atmospheric outflow from the Indo-Gangetic Plain: Impact of Biomass Burning emissions; paper presented at C4-workshop (changing chemistry in a changing climate) held at Indian Institute of Tropical Meteorology, Pune during 30-3rd May.

9) M.M. Sarin, **Srinivas Bikkina**, (2013), Mass absorption efficiency of Brown Carbon and Elemental Carbon in atmospheric outflow from the Indo-Gangetic Plain, AGU fall meeting, 2013AGUFM.A14B..05S

10) **Srinivas Bikkina,** Kimitaka Kawamura, Yuzo Miyazaki and Pingqing Fu, "What controls the atmospheric abundances of dicarboxylic acids in the open ocean: Insights from the Western North Pacific", Asia Oceania Geosciences Society-2014, 28 July – 2August, Sapporo, Japan, AS55-A005 (Oral Presentation).

References:

1) Prof. M. M. Sarin
Geosciences Division
Physical Research Laboratory
Ahmedabad – 380 009
Gujarat, India
E-mail: sarin@prl.res.in
Tel: +91 792631 4306

2) Prof. Kimitaka Kawamura
Atmospheric and Isotope Geochemistry Group
Institute of Low Temperature Science
Hokkaidio University
Sapporo, Japan
E-mail: kawamura@pop.lowtem.hokudai.ac.jp

3) Prof. Örjan Gustafsson,
Dept. Environmental Science and Analytical Chemistry (ACES)
Bolin Center for Climate Research
Stockholm University, Sweden
E-mail: Orjan.Gustafsson@aces.su.se

4) Prof. N.S.Sarma
Honorary Professor
Chemical Oceanography Division
Andhra University, Visakhapatnam
Andhra Pradesh, India
E-mail: nssarma@rediffmail.com

5) Prof. Richard Sempere
Director of MIO laboratory, CNRS
Mediterranean Institute of Oceanography (MIO)
E-mail: richard.sempere@mio.osupytheas.fr
richard.sempere@univ-amu.fr

6) Prof. Pinquing Fu
LAPC, Institute of Atmospheric Physics,
Chinese Academy of Sciences, Beijing, China
E-mail: fupingqing@mail.iap.ac.cn