A23E-0280

Mesh Intercomparisons of Fog Water Collected Yield Insight Into the Nature of Fog-Drip Collection Mechanisms

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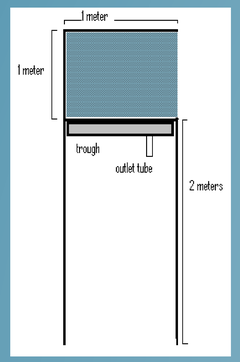
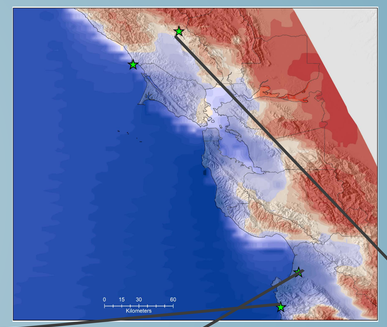
The Standard Fog Collector (SFC)



Abstract

Different materials manufactured internationally are being tested for their effectiveness at collecting fog water. This study highlights examines field deployments from three different types of mesh from three long-term "standard fog collector" (SFC) fog water collection sites along the Central California coast. In addition to looking at their overall total water collected over a period of time, we seek to tease out whether there are other factors that may contribute to relative mesh effectiveness. In particular, this study examines the effects of wind direction and wind speed on mesh fog water collection efficiency. The three types of mesh examined are the international standard double layer 35% shade coefficient raschel mesh, a metallic mesh coated with a hydrophic substance generated at MIT (Park et al. 2014), and a novel German mesh that was mounted in a fashion 90 degrees from its intended orientation.

Results of these tests indicate that while the Raschel was typically more effective than the other two types tested in this configuration, there appear to be some wind speed and wind direction factors that affect these meshes' relative performances.



The authors wish to acknowledge Mr. Dick Lind of the Naval Postgraduate School and Mr. Jim Cox of the Glen Deven Ranch for their support and for the data provided as well as Mr. Jeff Weiss for his database guidance. The authors also acknowledge Dr. Gareth McKinley, Dr. Robert Cohen, and Justin Kleingartner of MIT Dept of Chemical Engineering for preparing the MIT mesh. This project was supported by NSF – OCE1333976 and by funding provided by NBD Nanotechnologies.

Key Points

-A variety of different mesh are being tested for their effectiveness at fog capture within passive fog collectors.

-Comparisons are being done in situ which represent more realistic conditions than in a lab.

-The lowest-cost option, the raschel mesh, generally performs better in comparison to the rotated German and MIT coated screens.

-Differences in performance may also be a function of wind speed and wind direction, but there seems to be some site-to-site variation as well, so there may be other factors involved.

-Droplet size can also be a factor in mesh performance, but that is not as easily measured.

-Subsequent studies are looking at the performance of other types of mesh and at the German mesh, properly oriented. The raschel mesh, being the International Standard, represents an excellent control.

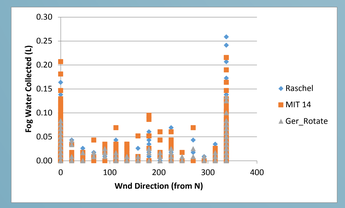
References:

Park KC, Chhatre SS, Srinivasan S, Cohen RE, McKinley GH. 2013. Optimal design of permeable fiber network structures for fog harvesting. Langmuir. 29(43) 13269–13277.

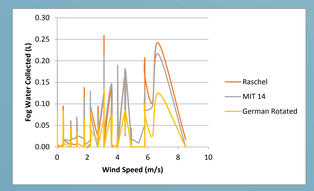
Schemenauer, RS and Cereceda, P. 1994. A proposed standard fog collector for use in high-elevation regions. Journal of Applied Meteorology and Climatology 33: 1313-1322.

Glen Deven Ranch

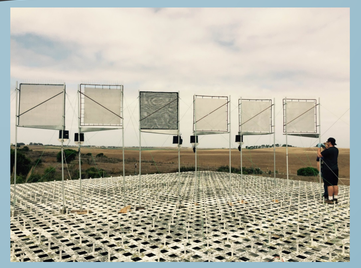
Glen Deven: Fog water collected from each of 3 passive fog collectors with different mesh types vs wind direction over 2015 fog season. Fog collector orientations are approximately 340°



Fog water collected from each of 3 passive fog collectors with different mesh types vs wind speed over the 2015 fog season.

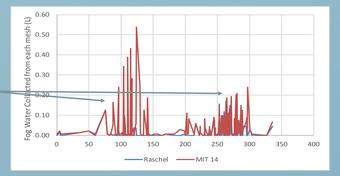


Fritzche Field

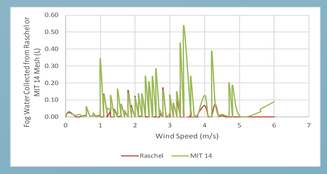


Fritzche Field: Fog Water collected from MIT and Raschel passive fog collectors vs wind direction over 2015 fog seasons. Collector orientation is approximately 280°

Note bidirectional distribution of fog collected with respect to wind speed at this site.

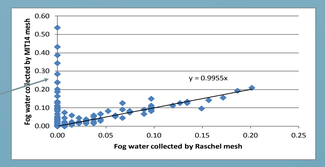


Fog water collected from each of 2 passive fog collectors with different mesh types vs wind speed over the 2015 fog season.



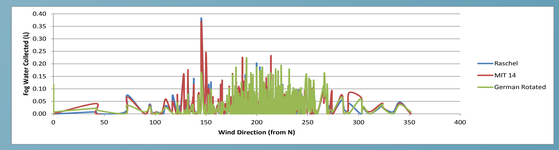
Fog water collected from MIT 14 fog collector and Raschel fog collector at Fritzche Field during the 2015 fog season

Note significant fog water collected from MIT 14 mesh with none collected from Raschel at same time. Perhaps this is related to directional characteristics associated with droplet re-entrainment from different mesh?

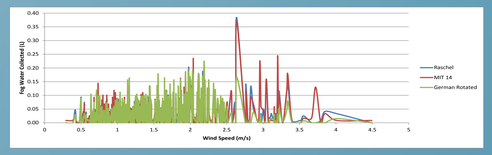


Pepperwood Preserve

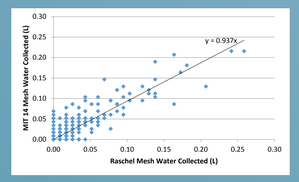
Pepperwood: Fog Water collected from each of 3 passive fog collectors with different mesh types vs wind direction over 2014-2015 fog seasons. Fog collector orientation is approximately 245°



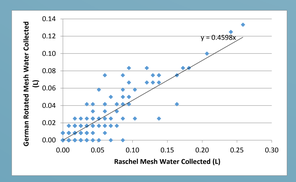
Fog Water Collected from each of 3 passive fog collectors with different mesh types vs wind speed over 2014-2015 fog seasons.



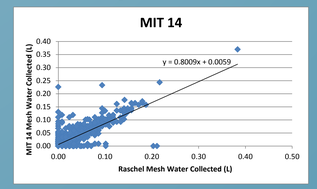
MIT 14 fog collector and Raschel fog collector during the 2015 season



Rotated German fog collector and Raschel fog collector during the 2015 season



MIT 14 fog collector and Raschel fog collector during 2014-2015 season



Rotated German fog collector and Raschel fog collector during 2014-2015 season