

## Accepted Manuscript

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PII: S0140-3664(16)30431-5  
DOI: [10.1016/j.comcom.2018.02.002](https://doi.org/10.1016/j.comcom.2018.02.002)  
Reference: COMCOM 5640



To appear in: *Computer Communications*

Received date: 12 October 2016  
Revised date: 22 June 2017  
Accepted date: 4 February 2018

Please cite this article as: J. Sánchez-García , J.M. García-Campos , M. Arzamendia , D.G. Reina , S.L. Toral , D. Gregor , A Survey on Unmanned Aerial and Aquatic Vehicle Multi-hop Networks: Wireless Communications, Evaluation Tools and Applications, *Computer Communications* (2018), doi: [10.1016/j.comcom.2018.02.002](https://doi.org/10.1016/j.comcom.2018.02.002)

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# A Survey on Unmanned Aerial and Aquatic Vehicle Multi-hop Networks: Wireless Communications, Evaluation Tools and Applications

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**Abstract:** Unmanned aerial and aquatic vehicle networks have attracted the attention of the wireless communication research community in the last decade. The low manufacturing costs for developing small unmanned vehicles and the notable developments on wireless communication technologies have made possible the design of cooperative applications involving multiple unmanned aerial and aquatic vehicles. However, the design of wireless networks, which include very dynamic and complex entities like unmanned vehicles, poses many challenges. Fortunately, unmanned aerial vehicle networks applications usually resemble those of unmanned aquatic vehicle networks such as military missions, or environmental monitoring among others. With the exception of the obvious differences in the lower layers of the wireless communications protocols, valid approaches used in the aerial medium could be easily adapted to the aquatic medium. This survey presents together the main features to take into account for designing unmanned aerial and aquatic vehicle networks with the aim to help the reader to transfer valid approaches and techniques between aerial and aquatic applications. We survey the results of more than 100 references on this topic published in international conferences and journals, and we also include the results of several bibliometric analyses in order to better present the status of the art and research directions on this scientific area.

**Keywords:** Unmanned aerial networks, aquatic Networks, wireless communications, simulation tools, bibliometric analysis.

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