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Mapping Research Collaboration Network of International Methane Hydrate Research

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Abstract

As a new type of potential energy, methane hydrate presents a very high resource value, has been a long-term research focus in oil and gas industry. Based on the Web of Science database, this paper analyzes the research collaboration of international methane hydrate. The paper gives a framework for collaboration network of methane hydrate research. Based on the 7194 collected papers during 2001-2016, the paper calculates the cooperation rate and cooperation degree of methane hydrate research at author, institution, and country level respectively. Furthermore, the Top 20 countries, and institutions in international methane hydrate research are given. The results provide effective support for mastering the international research of methane hydrate.

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Keywords: research collaboration; methane hydrate; social network analysis; bibliometrics

1. Introduction

Research collaboration has gradually become the mainstream of scientific research, which will help to improve the level and quality of scientific research, gather innovative ideas and cultivate new and comprehensive scientists [1-3]. Moreover, the research collaboration can help to achieve the leapfrog development in some areas. There is abundant research about research collaboration in each subject, but little research about methane hydrate [4-7]. Methane hydrate is a kind of ice-like crystalline material formed under the condition of natural gas and water under high pressure and low temperature [8]. It is a new type of potential energy source, which is mainly distributed in deep-sea sediments or permafrost. Related research shows that about 90% of the world's oceans and 27% of the land contain methane hydrate.

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The existing research on methane hydrate involves many aspects and has made significant progress. However, most of these research results are focused on unilateral theory or technology, and there are few studies on the bibliometrics of methane hydrate, especially lack of the research collaboration about methane hydrate. Therefore, on the basis of collecting the research papers on methane hydrate published in 2001-2016, this paper provides a framework for collaboration network of methane hydrate research, and then analyze the research collaboration situation. The results of the paper will help to understand the overall situation of the research collaboration on methane hydrate, and to guide the further research of methane hydrate.

2. A framework for collaboration network

There are many forms of research collaboration, such as the author collaboration, institution collaboration, and country collaboration [9-10]. Generally, the research collaboration information would be extracted based on the papers. Fig. 1 give a framework for collaboration network of methane hydrate research based on research papers.

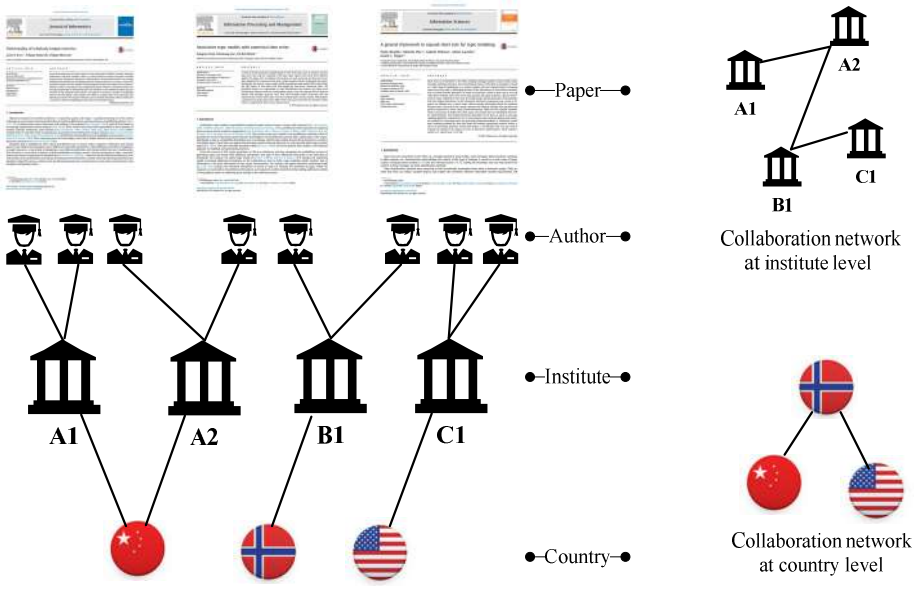

Fig.1. The framework for collaboration network of methane hydrate research.

As we know, there are a number of authors if a research paper collaborates at author lever. Furthermore, if the authors affiliated with different institutions, the paper collaborates at the institute level. When the institutes are from the various country, the paper collaborates at the country level. The Fig. 1 demonstrates the three kinds of research collaboration based on research papers. The research collaboration at author level reflects the cooperation and exchanges between the authors, the research collaboration at country level reflect the international cooperation.

3. Data and data cleaning

We collect the paper data from The WOS database. Because the methane hydrate is a research filed, not a subject, we search the paper data based on keyword. The search condition is set as " TS=((“gas hydrate*”) OR