| **RESEARCH ARTICLE**

Discourse Fluctuation of "Chinese Aerospace" in the Mainstream Media

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| **ABSTRACT**

Drawing upon the principles of Critical Discourse Analysis and Usage Fluctuation Analysis, this study investigated the discourse fluctuation of "Chinese aerospace" in the mainstream media of China, the US, the UK, and Russia, covering the initiating, consistent, transient and terminating collocates within the discourse; and also examines the diachronic change of their semantic similarity. It is further explained with an in-depth investigation of the ideology and social causes behind. Results show that Chinese and Russian media's attention to Chinese aerospace is on the rise, constructing an image of China as a strong nation leading in innovative aerospace technology; while British and American media's attention fluctuates considerably, conveying an ambitious image. This study offers a new perspective for the discourse analysis of news reports and contributes to the discursive construction of "Chinese aerospace".

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1. Introduction

The news media is a crucial vehicle for discourse. It transforms expertise into general knowledge and embeds ideology within its discourse, thereby shaping social consensus. It is evident that the discourse representation in news reports plays a significant role in shaping the national image. In recent years, there has been fruitful studies on the discourse representation and the construction of national image, covering topics such as the Chinese Dream (Qian & Huang, 2016), the Belt and Road Initiative (Apirakvanalee & Zhai, 2023), and Beijing Olympics (Boykoff, 2024). Most studies approach these topics from perspectives like high-frequency words, keywords, collocations, diachronic frequency changes, semantic prosody, and other specific discourse descriptions. However, there are fewer studies examining the cumulative effect of discourse meaning from a diachronic perspective, which is still in the exploratory stage. Moreover, previous related research has chosen English as the language of news reporting, with fewer studies focusing on multiple languages. As a supplement, this paper explores the discourse fluctuation of "Chinese aerospace" in the mainstream media of China, the US, the UK, and Russia from 2012 to 2022, taking Chinese, English and Russian languages as the focus languages of the corpus. Critical Discourse Analysis (CDA) (Wodak, 2001) and Usage Fluctuation Analysis (UFA) (Brezina, 2018: 241-255; McEnery et al., 2019) are adopted to examine the differences and diachronic changes in the discourse representation of "Chinese aerospace" in various mainstream media.

2. Literature Review

In the 1990s, corpus-based or corpus-driven research paradigms were widely recognized and rapidly entered the field of linguistic studies, which also included Critical Discourse Analysis (CDA). Corpus linguistics not only provides theoretical foundations for CDA (e.g., lexical-grammatical patterns, co-occurrence collocations, semantic distributions), but also methodological and technological support (e.g., corpus software quantifies a large amount of data and helps researchers to reveal the general laws of the discourse). In addition to its contribution in synchronic studies, corpus linguistics also provides guidance for critical discourse analysis in a diachronic/historical (hereinafter referred to as diachronic) perspective. For example, Baker et al. (2008) were the first to integrate

the research methods of critical discourse analysis and corpus linguistics to carry out a diachronic analysis of refugees and migrants in the British news reports.

With the continuous advancement of diachronic research, new approaches to diachronic discourse studies have also emerged. The change of discourse in diachronic contexts is dynamic and complex. Discourse attracts new semantic meaning, loses its original semantics, and undergoes lexical changes and semantic shifts in/out of heavy use (McEnery et al., 2019: 416). In this paper, Usage Fluctuation Analysis (UFA) is utilized, which is an analytical method that can investigate diachronic discourse and to track the aforementioned dynamics. Specifically speaking, UFA is able to locate initiating, consistent, transient and terminating collocation words (i.e., collocates), helping researchers to identify the microscopic patterns of linguistic evolution, to analyze the impact of these changes on the discourse, and to assist in the qualitative analysis of discourse. Related studies (e.g., Gillings & Dayrell, 2024) have shown that UFA has strong explanatory capability for diachronic discourse analysis. The essence of UFA is to find the collocations of nodes (i.e., node words) and thus to figure out words' contextual meaning, as illustrated by Firth's (1951) statement "You shall know a word by the company it keeps". Harris's (1954: 146) distributional hypothesis suggests that the distribution of an element can be understood as the sum of all its environmental elements. In discourse analysis, the environment is the context of the discourse, which consists mainly of both intra- and extra-linguistic aspects. A word and its co-occurring words are the result of the co-selection of these two contexts. Similarly, collocations are words that co-occur with node words. It can be concluded that UFA provides a new path for corpus-based critical discourse analysis.

3. Methodology

3.1 Data collection

The corpus for the current study was collected through LexisNexis, covering the year period from January 1, 2012, to December 31, 2022. The collected data includes news reports on "Chinese aerospace" from mainstream media in China, the US, the UK, and Russia. To clarify the dissemination and reception of "Chinese aerospace" in each country, the news reports are in the official languages of the respective countries, involving Chinese, English, and Russian languages. In the phase of data collection, searches were conducted using the following commands: 中国 AND ("航天" OR "载人飞船" OR "卫星" OR "火箭" OR "空间站"), (China OR Chinese) AND ("aerospace" OR "spacecraft" OR "satellite" OR "rocket" OR "space station"), (китайская OR китайский) AND ("аэрокосмическая промышленность" OR "космический корабль" OR "спутник" OR "ракета" OR "космическая станция"). The search results were then filtered by time range and mainstream media of each country for batch downloading. After manual screening, a total of 775 news reports were collected, amounting to a total corpus size of 600,105 tokens. The numbers of reports from mainstream media in China, the US, the UK, and Russia are 292, 147, 179, and 157 respectively, with corpus sizes of 306,649 tokens, 110,324 tokens, 139,812 tokens, and 43,320 tokens respectively.

3.2 Data processing and analysis

This study first utilized Kendall's τ test to examine the diachronic change of the number of news reported by the mainstream media of four countries. Usage fluctuation analysis was carried out in the following four steps: 1) The raw corpus was distributed in chronological order into individual text files, with each file representing one calendar month; 2) BFSU Stanza Tagger 1.2 was used for lemmatization of the English and Russian languages and for tokenization of the Chinese language; 3) The node words "China" and "Chinese" ("中国" in Chinese language; "Китай" and "китайский" in Russian language) were identified, with collocation parameters set to [MI3(5), L8-R8, C5-NC5]. Stop words were then filtered out, and co-occurrence collocation words were then located. Using a 12-month overlapping sliding window, Gwet's AC_1 (a measure of agreement) was employed to calculate the collocation similarity matrix (Gwet, 2008). All these steps were implemented using Python 3.11.5 (Python Software Foundation, 2023); 4) Based on the AC_1 values and time series, the Generalized Additive Model (GAM) was applied in R 4.3.1 (R Core Team, 2023) to smooth the data and to observe the diachronic semantic fluctuations.

3.3 Research questions

This study aims to address the following three questions:

(1) What are the diachronic trends of mainstream media coverage of "Chinese aerospace" in China, the US, the UK, and Russia?

(2) What are the consistent, initiating, transient and terminating collocates concerning "Chinese aerospace" in mainstream media reports of the four countries? What are their similarities and differences?

(3) What are the similarities and differences in the diachronic fluctuation of collocation similarity for "Chinese aerospace" among the mainstream media of the four countries?

4. Results and Discussion

4.1 Results of the diachronic trends

Figure 1 shows the diachronic change of the number of news reports on "Chinese aerospace" in the mainstream media of China, the US, the UK, and Russia. Table 1 presents the results of Kendall's τ correlation coefficients between the number of news reports and the time.
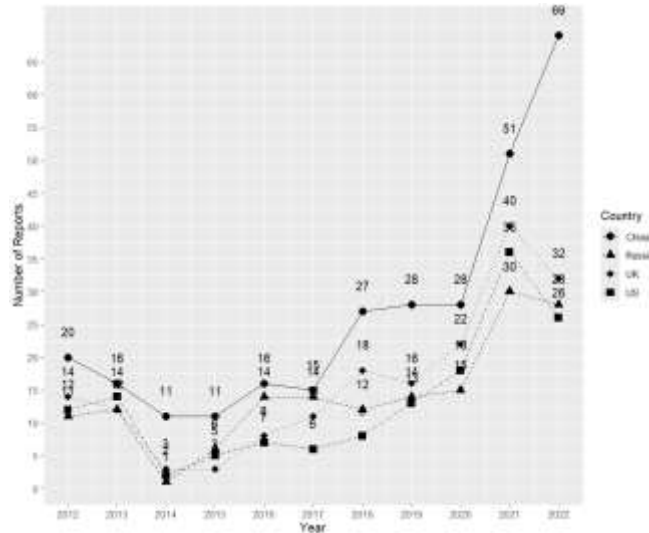

Figure 1. The diachronic change of the number of news reported by the mainstream media of four countries

Table 1. Kendall's τ correlation coefficients between the number of news reports and the time

Country	Kendall's τ correlation coefficients	Sig.
China	0.636	<0.01
US	0.527	0.026
UK	0.587	0.012
Russia	0.699	<0.01

As shown in Figure 1 and Table 1, the number of reports on "Chinese aerospace" in the mainstream media of the four countries demonstrated an overall upward trend from 2012 to 2022 (namely, Kendall's τ correlation coefficients are all greater than 0.5). Notably, the mainstream media in Russia and China experienced significant ($p < 0.01$) and sharp increases. On the one hand, the significant rise in media reports aligns with the rapid advancements of "Chinese aerospace" and the positive achievements in China's space program, such as the successful landing of the Chang'e lunar missions. On the other hand, the results indicate the increasing attention given to China's space program by these countries, especially China and Russia.

4.2 Results and analysis of discourse fluctuation of "Chinese Aerospace" in four countries' mainstream media

Based on the principle of UFA, this section examines the consistent, initiating, transient and terminating collocates concerning "Chinese aerospace" in mainstream media reports of the four countries, and compares their similarities and differences. This section is divided into four sub-sections.

4.2.1 The consistent topics

The consistent topics are those relatively stable collocates surrounding node words over time. This study extracted collocates with a time coverage rate of 90-100%, as shown in Table 2.

Table 2. The consistent collocates from 2012 to 2022

China		US	
Collocates	**Time period**	**Collocates**	**Time period**
中国	2012/01-2022/12	China	2012/01-2022/12
航天	2012/01-2022/12	space	2012/01-2022/12
任务	2012/01-2022/12	program	2012/01-2022/12
太空	2012/01-2022/11	moon	2012/01-2022/11
技术	2012/06-2022/10	ambitious	2012/06-2022/06

科技	2012/06-2022/11	send	2012/06-2022/11
事业	2012/06-2022/11		
系统	2012/06-2022/12	**Russia**	
UK		**Collocates**	**Time period**
Collocates	**Time period**	KHP（China）	2012/01-2022/12
China	2012/01-2022/12	космический（aerospace）	2012/01-2022/12
space	2012/01-2022/12	программа（mission）	2012/01-2022/11
mission	2012/01-2022/12	космонавт（astronaut）	2012/06-2021/06
ambitious	2012/06-2022/10		

As can be seen from Table 2, there is a high degree of similarity in the consistent collocates of the mainstream media of the four countries during the period of 2012-2022, with "China (中国, KHP)" being the fixed collocates of the four countries, and "space (航天, космический)" being the stable word used by the Chinese and Russian media, which indicates that the mainstream media in China and Russia adopted the explicit strategies to highlight "Chinese Aerospace"; while the American and British media used the related word "space" to refer to "Chinese Aerospace". For example, on 29 June 2012, CNN published a report entitled "China's giant, quiet step in space", which maps Chinese spaceflight by linking the semantic meaning of "China" and "space". The difference among the four is that the Chinese media consistently used words like "技术 (technology)", "科技 (science and technology)" and "系统 (system)", reflecting China's focus on the sustainable development of space technology and systems. The Russian media continued to use the collocate "космонавт (astronaut)", reflecting Russia's concern about the dynamics of Chinese astronauts and the cooperation between the two countries. The consistent use of the collocate "ambitious" by the American and British media is both a recognition of the strength of China's aerospace and a reflection of its ambitious national image.

4.2.2 The initiating topics
The initiating topics are reflected in the collocates that appear at specific points in time and recur until the end. Through the initiating collocates, we can glimpse the time points at which new topics emerge and the historical events behind them. The results are shown in Table 3.

Table 3. The initiating collocates from 2012 to 2022

China		UK	
Collocates	**Time period**	**Collocates**	**Time period**
载人	2012/06-2022/12	station	2012/06-2022/12
飞船	2012/06-2022/12	first	2012/06-2022/12
运载火箭	2012/06-2022/12	astronaut	2012/06-2022/12
航天员	2012/06-2022/12	national	2012/06-2022/12
完成	2012/06-2022/12	launch	2012/06-2022/12
成功	2012/06-2022/12	tiangong	2013/06-2022/12
首	2012/06-2022/12	Russia	2015/11-2022/12
空间站	2012/11-2022/12	earth	2016/08-2022/12
建造	2013/06-2022/12	**Russia**	
探索	2013/06-2022/12	**Collocates**	**Time period**
US		запуск（launch）	2012/06-2022/12
Collocates	**Time period**	модуль（module）	2012/06-2022/12
astronaut	2012/06-2022/12	россия（Russia）	2012/06-2022/12
station	2012/06-2022/12	орбита（orbit）	2012/06-2022/12
satellite	2012/06-2022/12	станция（space station）	2012/06-2022/12
first	2012/06-2022/12	первый（first）	2012/06-2022/12
technology	2018/12-2022/12	национальный（national）	2020/12-2022/12

As shown in Table 3, the Chinese mainstream media had the most initiating words, while the American ones had the fewest. Among the four countries' mainstream media, most of the initiating collocates started appearing in June 2012. This time point marks a significant moment in China's space history when China launched the Shenzhou 9 manned spacecraft, which successfully docked

with the Tiangong-1 space station, and Liu Yang became China's first female astronaut. The initiating collocates like "载人 (manned)", "飞船 (spacecraft)", "航天员 (astronaut)" and "空间站 (space station)" are all related to these historic events, indicating that since June 2012, China has improved its space infrastructure and carried out manned space missions, steadily attracting the attention of mainstream media in these four countries.

Notably, the collocate "first" (首, первый) appeared across all four countries' mainstream media, indicating that since June 2012, China's space program has achieved groundbreaking milestones. Co-occurrence analysis reveals that in Chinese media, "首" often co-occurs with words like "次 (times)" and "飞 (flight)". In American media, "first" frequently appears in phrases like "the first time", "the first to" and "the first woman". In British media, "first" is commonly seen in expressions such as "the first time" and "the first country". In Russian media, "первый" often appears as "первый китайский (China's first)" and "первый в истории китайской (the first in China's history)". This demonstrates that all four countries' media focus on the pioneering and breakthrough achivements of China's space program.

Unlike the other three countries' media, Chinese media initiated two positive collocates "完成 (complete)" and "成功 (success)" in June 2012, and "建造 (construction)" and "探索 (exploration)" in June 2013, reflecting the favorable development and continuous progress of China's endeavors in space. Additionally, the British media initiated the collocate "Russia" in November 2015, indicating their interest in Sino-Russian cooperation in space.

4.2.3 The transient topics
The transient topics are reflected in collocates that flash up in a relatively short period of time. The results are shown in Table 4.

Table 4. The transient collocates from 2012 to 2022

China		US	
Collocates	**Time period**	**Collocates**	**Time period**
新	2014/11-2022/12	U.S.	2016/09-2022/08
未来	2015/03-2022/09	race	2018/12-2022/08
探测	2015/12-2022/05	exploration	2018/12-2022/12
国际	2016/01-2022/09	science	2020/03-2022/11
提升	2016/01-2022/12	goal	2020/07-2022/11
能力	2016/01-2022/08	successful	2020/11-2020/12
创造	2016/04-2022/12	cooperation	2020/12-2021/10
建设	2016/06-2022/11	Russia	2021/03-2022/08
成就	2016/10-2022/08	SpaceX	2021/04-2022/02
人类	2017/06-2022/12	NASA	2021/05-2022/11
合作	2017/06-2022/09	**Russia**	
UK		**Collocates**	**Time period**
Collocates	**Time period**	вклад（contribution）	2012/06-2013/06
U.S.	2016/08-2022/03	важный（significant）	2012/06-2013/06
burn	2016/09-2016/11	запустить（launch）	2012/06-2020/09
control	2016/09-2018/04	страна（nation）	2012/06-2021/04
nation	2019/01-2021/05	космос（cosmos）	2012/06-2021/12
scientist	2019/01-2021/12	миссия（mission）	2012/06-2021/10
criticise	2019/01-2021/10	проект（project）	2020/11-2022/11
mars	2020/01-2021/10	строительство（construction）	2021/03-2021/10
complete	2021/04-2022/06	международный（international）	2021/06-2021/10

From 2012 to 2022, new topics continuously emerged in the mainstream media of China, the US, and the UK, reflecting the complexity and diversity of their attitudes towards China's aerospace. In contrast, fewer topics emerged in Russian media reports, with the narrow scope of topics. As shown in Table 4, the transient collocates in Chinese media are mostly positive. From a diachronic perspective, Chinese aerospace reported by the Chinese media has gone through various changes, including

technological advancements, exploration missions, the enhancement of international status, increased development capabilities, and international cooperation.

The transient collocates in American media gradually shifted from focusing on China's space exploration to cooperation and competition among space powers, such as NASA, SpaceX and Russia. While acknowledging China's scientific innovation, American media expressed concerns about China's future goals, such as "the goal of a manned moon landing".

Those collocates in British media reveal that since August 2016, the dominant tone of British media coverage on Chinese aerospace has been negative, with fewer positive evaluations. British media particularly focused on the relationships between China, the US, and Russia in the space field, noting that the U.S. and Russia remain the dominant forces in space, but China is catching up as the third nation to operate a space station. Notably, since May 2020, British media have paid special attention to China's Mars mission, recognizing significant progress in Mars exploration efforts.

The transient collocates in Russian media are mostly neutral. Since June 2012, Russian media have focused on China's space missions, acknowledging China's significant contributions (важный вклад) to the development of space exploration. Since 2021, Russian media have particularly focused on the construction of the international space station (Строительство международной космической станции).

4.2.4 The terminating topics
The terminating topics are those collocates that started in January 2012 and ended at a certain point in time.

Table 5. The terminating collocates from 2012 to 2022

US	
Collocates	**Time period**
develop	2012/01-2013/06
seek	2012/01-2013/01
key	2012/01-2020/06
UK	
Collocates	**Time period**
increasingly	2012/01-2016/03
important	2012/01-2020/06

As can be seen in Table 5, there are no terminating collocates in the Chinese and Russian mainstream media. The terminating collocates in the US media show that the US media ended three positive words (i.e., develop, seek, and key) in January 2013, June 2013 and June 2020, respectively. The British media ceased to use the collocate "increasingly" in March 2016, which can be previously found in phrases like "play an increasingly important role" and "be increasingly dependent on".

4.3 Analysis of the diachronic fluctuation of collocation similarity
In this section, the collocation similarity matrix was calculated and the data were then smoothed, the results of which are shown in Figure 2. Higher value of AC_1 indicates a higher degree of semantic similarity; the 95% (dark region) and 99% (dark region plus light region) points outside the confidence interval are the points where significant semantic changes take place (Brezina, 2018: 243); a decreasing curve indicates that the semantic meaning of the topic tends to be more diverse, and vice versa indicates convergence.

Firstly, the diachronic fluctuations for Chinese and Russian media are quite similar, so are those for American and British media. This indicates that the semantic changes in the reports on Chinese aerospace are more aligned between Chinese and Russian mainstream media, as well as between American and British mainstream media. Secondly, there are numerous outliers in Figure 2 for all four countries, reflecting the significant impact of factors such as ideology and socio-cultural factors on the semantic meaning of the news reports, with the curves for American and British mainstream media showing more volatility. Thirdly, from 2012 to 2014, the curves for all four countries show an upward trend, indicating converging semantics, possibly due to the relatively few major events regarding Chinese aerospace during this period. From 2014 to 2016, the semantics began to diversify across the four countries' media. From 2019 to 2022, Chinese aerospace developed rapidly, achieving multiple milestone events. The positive semantic changes in Chinese media were particularly dramatic, while the neutral semantic changes in Russian media were relatively stable. Fourthly, the Generalized Additive Model has the capability to predict future trends based on time series. According to the

curve trends, it can be predicted that in the future the semantic meaning of reports on Chinese aerospace in the mainstream media of the four countries will become increasingly diverse.
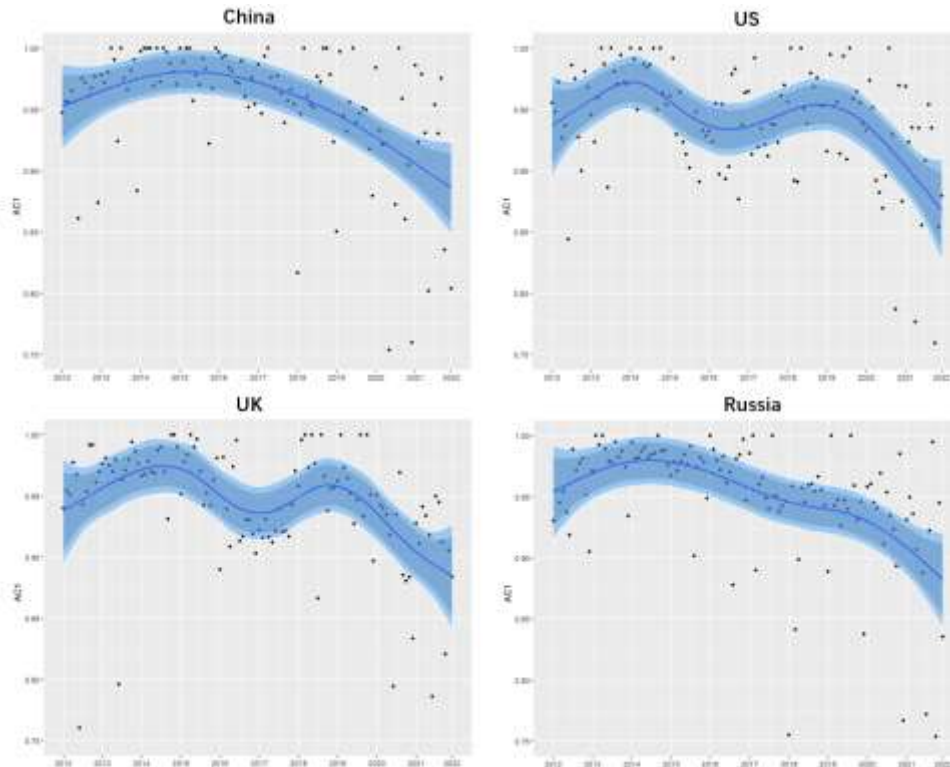

Figure 2. The diachronic fluctuation of collocation similarity of four countries

5. Conclusion

Based on what have been discussed, it can be concluded that the attention given to Chinese aerospace by Chinese and Russian mainstream media has significantly increased, while the attention from British and American mainstream media has shown greater fluctuations. Chinese mainstream media have constructed an image of China that is led by innovation and shared by cooperation. Russian media have maintained a neutral tone, objectively describing China's endeavors in space, especially in terms of technological innovation, reflecting the image of China as a technological powerhouse in space.

National image is constructed through the discursive representation in news media, and the dissemination and reception of discourse are complicated, with semantic changes often influenced by various contextual factors. Therefore, this study considered three extra-linguistic contextual factors (i.e., country, language of dissemination, and diachronic changes) as well as the intra-linguistic contextual factor of lexical collocation. With the help of UFA, the study is able to examine the initiating, consistent, transient and terminating collocates related to Chinese aerospace in the media discourse, as well as the diachronic dynamic changes in collocative semantics. This study provides a new descriptive perspective and research approach for corpus-based discourse analysis, and offers empirical evidence for the multidimensional examination of media discourse.

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