

# Comparison of the Palaeomagnetic Parameters of Non-Marine Jurassic-Cretaceous Boundary Sediments in Dorset (SW England), Hebei and Liaoning (NE China)—A Preliminary Study

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## Abstract

The Purbeck beds in Dorset, the Tuchengzi Formation in western Liaoning Liaoning Province or the Houcheng Formation in northern Hebei Province are non-marine Jurassic/Cretaceous (J/K) boundary sequences. A Czech-China Inter-Governmental S&T Cooperation Project has been carried out to search for the non-marine J/K boundary in northern China and making international correlation with the Purbeck beds in southern England. The combination of palaeomagnetism and biostratigraphy in northern China and southern England localities proves that these distant places had similar climatic conditions and the same fauna during the Late Jurassic and Early Cretaceous. A preliminary joint research has shown a fruitful result in searching for the non-marine J/K boundary in northern China.

## Keywords

Jurassic-Cretaceous Boundary, Dorset, Northern Hebe, Western Liaoning, Palaeomagnetism, Biostratigraphy

## 1. Introduction

A joint study of the Jurassic/Cretaceous (J/K) boundary sections in northern China [1] and Dorset, southwestern England [2] [3] began in the year 2017. In

northern China the well-developed non-marine Upper Jurassic to Lower Cretaceous sequences are widely distributed, which straddle the J/K boundary, and suitable for the study of the J/K boundary magnetostratigraphy [4] [5].

In recent years, more and more precise radiometric dating data indicate that the Tuchengzi Formation in western Liaoning and the contemporaneous Houcheng Formation in northern Hebei straddle the J/K boundary [6] [7]. Palaeomagnetic and magnetostratigraphic research clarifies and constrains interpretations of the J/K boundary interval.

The studied Dorset sites are on the Isle of Portland and at Swanage. The first, the older, is Jurassic in age. It consists of six successive sequences. Layered marine cherty limestones are below and homogeneous Portland “freestone” carbonates being above, with the non-marine Purbeck beds overlying. The other section is the major cliff profile at Swanage, entirely in continental Purbeck sediments, of Tithonian to Berriasian age.

## 2. Methods

Palaeomagnetic methods used differ between the carbonate rocks and clastics. Thermal demagnetisation dominated for the Portland Stone limestone and the sediments in the upper part of the Swanage section. Alternate field demagnetization was performed on the more clastic sediments in the lower part of the Swanage Purbeck section and on all the Chinese samples. The main carriers of magnetization were investigated using analysis of the isothermal remanent magnetization curve following Kruiver *et al.* [8].

## 3. Results

We show that in Hebei and Liaoning the sedimentation rate was so rapid that individual studied profiles contain only one magnetozones, which is an advantage for magnetostratigraphy when it is used as an aid for the J/K boundary determination. Specifically, we have found that both measured profiles of the Houcheng Formation in northern Hebei have a normal polarity, whereas the measured profile of the Tuchengzi Formation displays a reverse polarity. The individual profiles are to be stratigraphically linked.

The preliminary results on the Portland sediments prove only one normal polarity zone with one subzone. The first result from pilot sampling in the Purbeck beds at Swanage shows at least three normal and two reverse polarity zones.

Additionally, we have identified fossils of the clam shrimps (Diplostraca) [9] [10] and ostracods (Ostracoda) and combined them with magnetostratigraphy. This allowed correlations of sites in northern China with southern England.

## 4. Discussion

More magnetozones might be still recognized in both areas. The sampling in northern China has to continue above and below the sampled profiles, and the section at Swanage has to be sampled more densely. Measurement of previously

sampled specimens still continues. Bed-by-bed correlation of the results between the studied part of the Swanage section and the results of Ogg *et al.* [11] is a priority.

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### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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