PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

Basement Control of Structures in the Mesozoic Rocks in the Strait of Dover Region, and Its Reflexion in Certain Features of the Present Land and Submarine Topography: Appendix. Faulting in the Kent Coalfield

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Appendix. Faulting in the Kent coalfield

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Nearly all the information available on the faulting in the Kent Coalfield is from provings in the workings of the four collieries from which coal has been won extensively – Chislet, Snowdown, Tilmanstone and Betteshanger. The known faulting at Snowdown and Tilmanstone has recently been studied in considerable detail by the author for the purpose of preparing

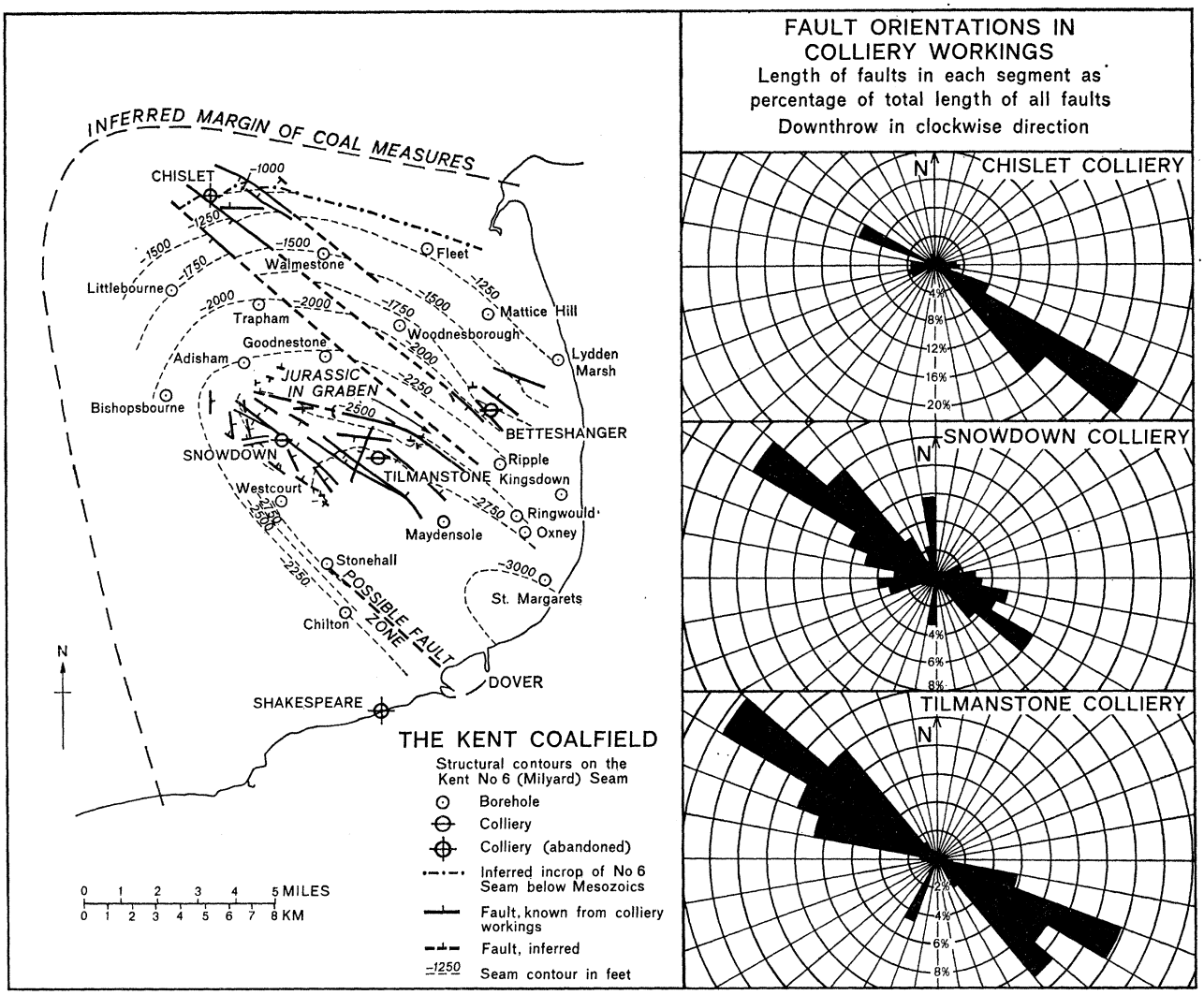

Figure 1. Structure of the Kent Coalfield, with insets showing the fault orientations in Chislet, Snowdown and Tilmanstone Collieries.

conjectural fault-patterns in areas planned for development at these collieries. These fault-patterns were required for exercises in Geosimplan, a simulation technique developed by the National Coal Board's Geological Branch for measuring the likely economic outcome of working, over a period of a few years, areas in which there is uncertainty regarding the detailed geology.

At each of these two collieries, the orientation, direction of throw and maximum amount of throw of each proved fault, or portion of a fault, were measured and recorded from mine plans; and the intensity of faulting was assessed by counting the number of faults (or portions of faults) within each $\frac{1}{4}$ km² (National Grid) of which more than half has been worked, averaging these figures for 1 km squares, and using a 'moving average' to give a measure of regional fault intensity. From the recorded orientations and directions of throw, the total length of faults within each segment of 10°, expressed as a percentage of the total length of all recorded faults in the colliery, was plotted on polar coordinate graph paper, as shown in figure 1. Faults with the same orientation but opposite direction of throw appear in segments 180° apart on this diagram, the downthrow being in the clockwise direction in each case.

Snowdown Colliery

The diagram for this colliery in figure 1 is based upon provings in the Kent no. 6 (Milyard) seam – the only seam worked at this pit since 1927. It will be seen that over 60 % (by length) of the faults have orientations between W 10° N–E 10° S and N 30° W–S 30° E, the majority of these trending approximately NW–SE, a direction corresponding with the orientation of the axis of the main syncline in which the coalfield is disposed.

A second system of faults, with orientations between W 10° N–E 10° S and W 20° S – E 20° N, forms 18 % of the total fault length, and a further subsidiary system, contributing about 10 % of the total length, is alined within 10° of a N-S direction.

Only about 5 % of the faults have throws exceeding 6 m (20 ft), and as many as about 75 % have throws of less than 1.5 m (5 ft). Faults of the first two systems occur over the whole colliery take, a few having been proved over distances of 1 km or more, and a few having throws exceeding 15 m (50 ft). Faults of the N–S system, however, are largely confined to the western portion of the take, and although generally persistent over considerable distances, have no recorded throws exceeding 3 m (10 ft).

The faulting varies greatly in intensity over the colliery take – from 1 to 32 faults/$\frac{1}{4}$ km². There are slight regional decreases in fault intensity from south to north (from over 9 to under 8 faults/km²) and from west to east (from over 9 to under 6 faults/km²), but these trends are largely masked by the much wider and more rapid local variations.

Tilmanstone Colliery

The diagram for this colliery in figure 1 is based upon provings in the Kent no. 1 (Beresford) seam, which was worked at this pit for many years until 1961, and in the Kent no. 6 seam, which has been worked from 1956. The preferred fault orientation is, much more markedly than at Snowdown, between W 10° N–E 10° S and N 30° W–S 30° E, about 90 % of the total proved fault length lying within this sector.

Faults with orientations between W 10° N–E 10° S and W 20° S–E 20° N are very subsidiary (about 4 %), and no faults have been proved with a near N–S direction. However, there is one persistent fault, with an approximate NNE–SSW orientation, that accounts for most of the remainder of the proved faulting; this orientation is anomalous for the Kent Coalfield as known at present.

Several of the faults are known to extend over distances of at least 1.6 km, but only two have been proved to have throws exceeding 15 m (50 ft). One of these marks the northern limit of past workings in the Kent no. 1 seam, and brings Jurassic rocks (identified as Upper Oxford Clay at

the sole proving, in 1940) against the Coal Measures at the horizon of this seam. There is geophysical evidence that this fault either splits or dies out in a westerly direction from Tilmanstone; it may be continuous with one or more of the larger faults proved by drivages in the north of the Snowdown take.

The intensity of faulting is, in general, considerably less than at Snowdown (0 to 17 faults/$\frac{1}{4}$ km^2). The regional fault intensity varies between 3 and 6 faults/km^2, being greatest north and east of the shafts.

Chislet Colliery

At this colliery, which was abandoned in 1969, three major faults have been proved with orientations corresponding with those of the main group of faults at Snowdown and Tilmanstone (between N 40° W–S 40° E and W 20° N–E 20° S). These faults have throws exceeding 40 m (140 ft) and comprise 50 % of the total proved faulting. Much of the remaining faulting, which is far less intense than at Snowdown or Tilmanstone, is alined in the same direction, as indicated in the diagram for this colliery in figure 1, which is based on provings in the Kent no. 7 (Chislet no. 5) seam, virtually the only seam to have been worked.

There is, however, a subsidiary fault system with orientations between W 10° N–E 10° S and W 30° S–E 30° N.

Betteshanger Colliery

At this colliery faults are relatively rare, most of those proved having orientations corresponding with that of the main fault-system at the other three pits. The Kent no. 6 seam in this pit is affected by a series of rapid local thinnings with complementary thickenings, the very thick and very thin coal occurring in narrow channels and ridges trending in roughly the same direction as the main fault-system of the coalfield.

Two faults with fairly large downthrows to the southeast have been proved in drivages beyond the limits of working in the south of the take, and one or both of these faults may be continuous with the central major fault at Chislet. If this is so, the southern major fault (the Stodmarsh fault) at Chislet may continue southeastwards as suggested in figure 1 to form the northern boundary of a graben whose southern boundary is the large fault to the north of Tilmanstone.

Hades of faults

Most of the faults studied can be described as 'normal faults', although some show reversal of direction of throw along their proved courses. In the southwest of the Snowdown take a number of reversed faults of comparatively small throw have been recorded.

The faults that have been traced from one seam to another are mainly those affecting the Kent nos. 1 and 6 seams at Tilmanstone (a vertical distance of about 460 m (1500 ft)) and the Kent nos. 6 and 7 seams at Betteshanger (vertical distance about 75 to 90 m (250 to 300 ft)). From these faults and other evidence, it is probable that most of the faults in the coalfield have low hades, usually under 20°.

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