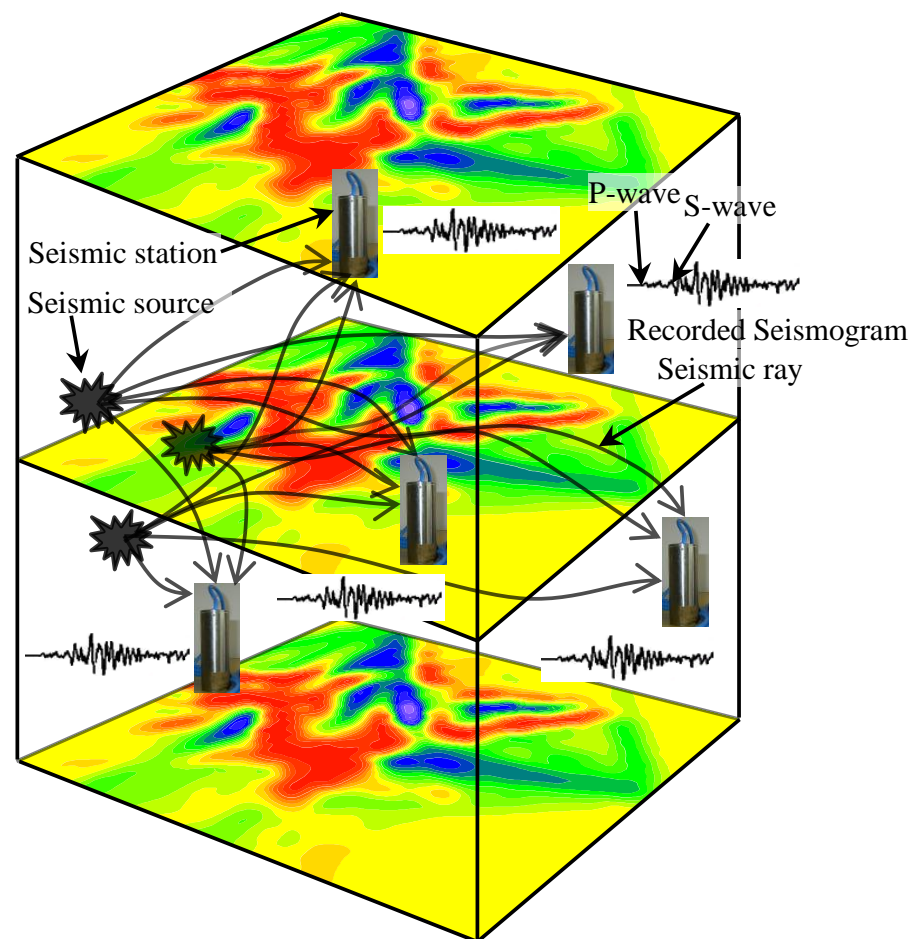


## 区域应力场 CT 探测技术

- CT 应力场探测原理
- 弹性波(主动) CT 探测
- 震动波(被动) CT 探测
- 双震源一体化 CT 探测



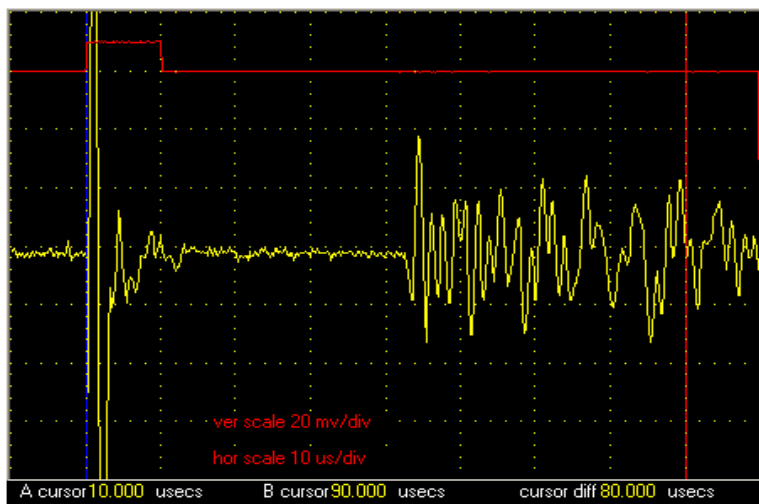
# 5.1) CT应力场探测原理



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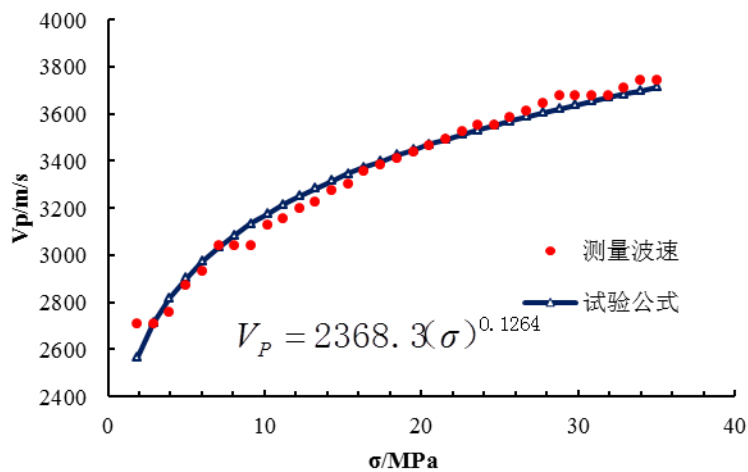
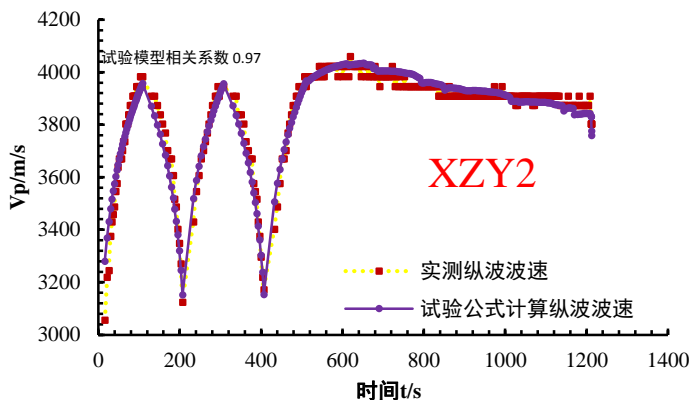


## □ 应力与波速间具有正相关

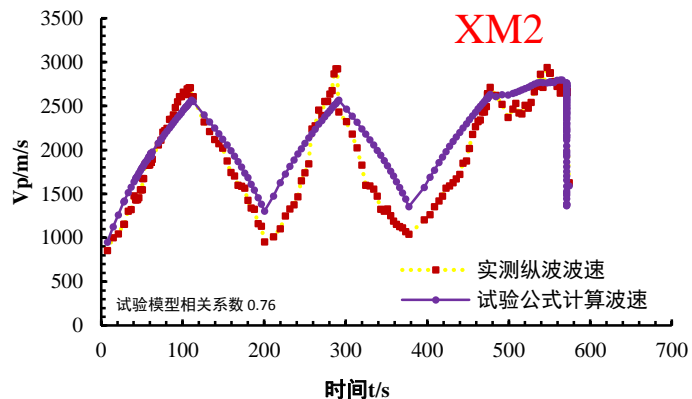


岩石

$$V_P = \varphi (\sigma)^\psi$$



煤



### ➤ 波速异常值 $A_n$

$$A_n = \frac{V_p - V_p^a}{V_p^a}$$

### ➤ 波速变化梯度 $VG$

$$A_n = \frac{VG - VG^a}{VG^a}$$

### ➤ 应力集中系数 $\varphi$

$$\varphi = \frac{\left(\frac{V_p}{\phi}\right)^{1/\psi}}{\sigma_p^a}$$

# 5.2) 弹性波(主动) CT 探测

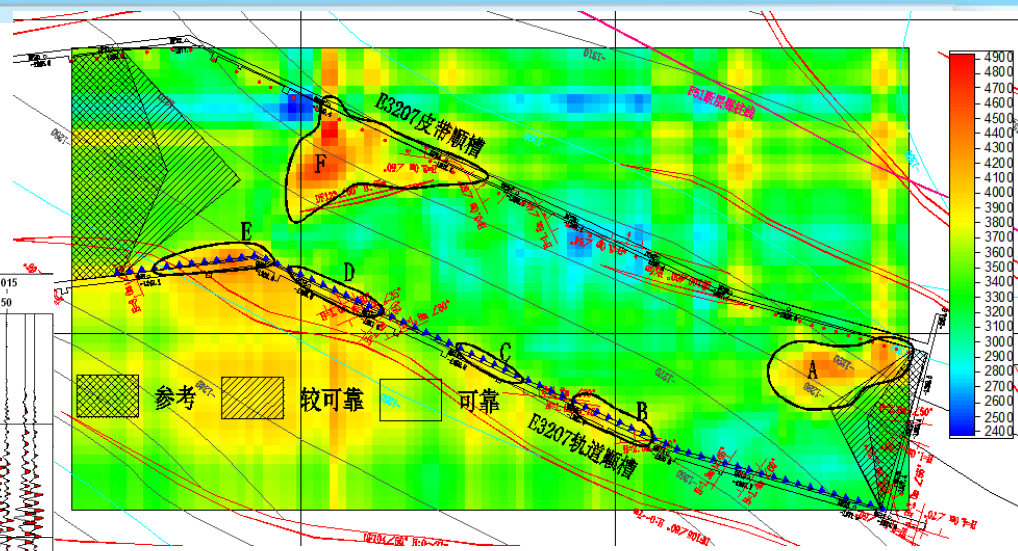
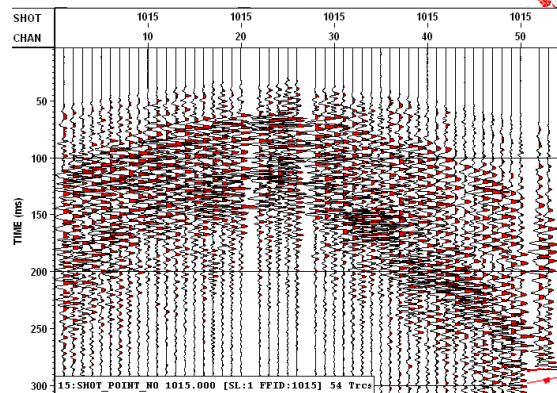
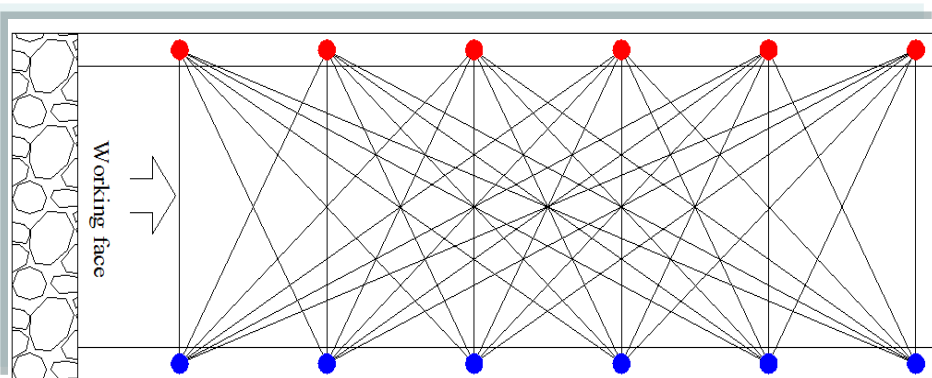


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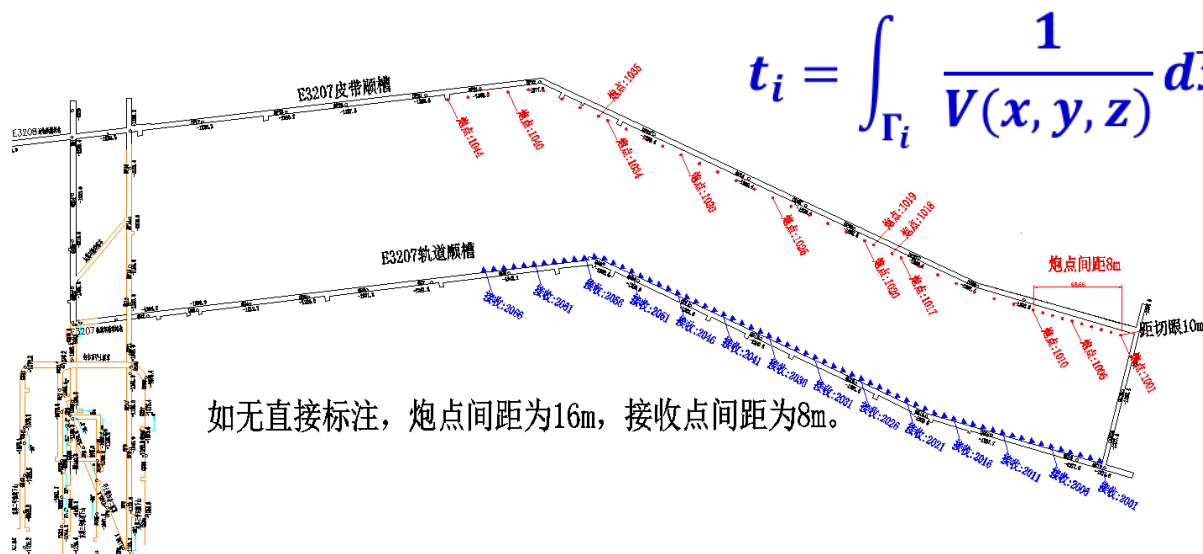


## 弹性波（主动）CT探测技术（2011）

### 星村煤矿E3207面

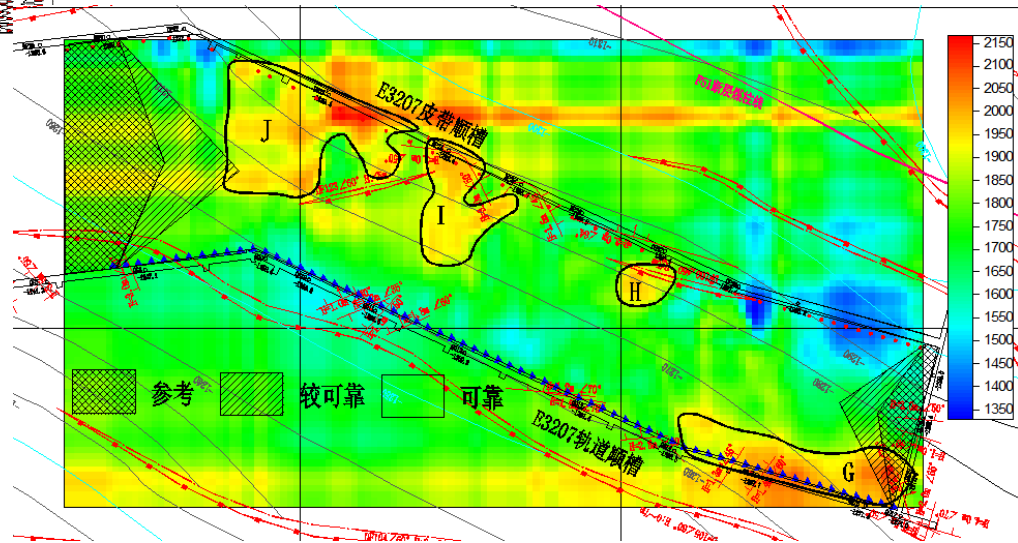


P波分布



如无直接标注, 炮点间距为16m, 接收点间距为8m.

$$t_i = \int_{\Gamma_i} \frac{1}{V(x, y, z)} d\vec{x}$$



S波分布



# 5.3) 震动波(被动) CT 探测

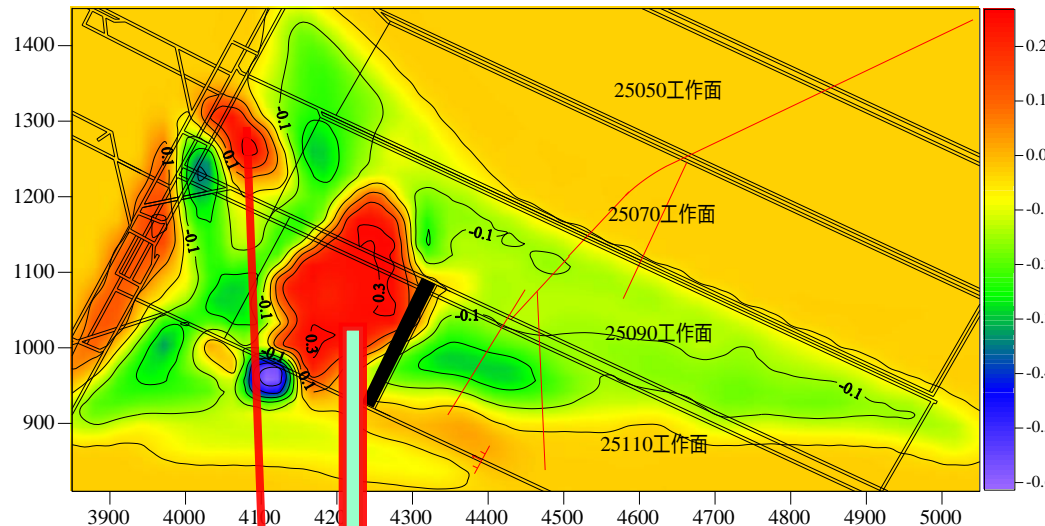
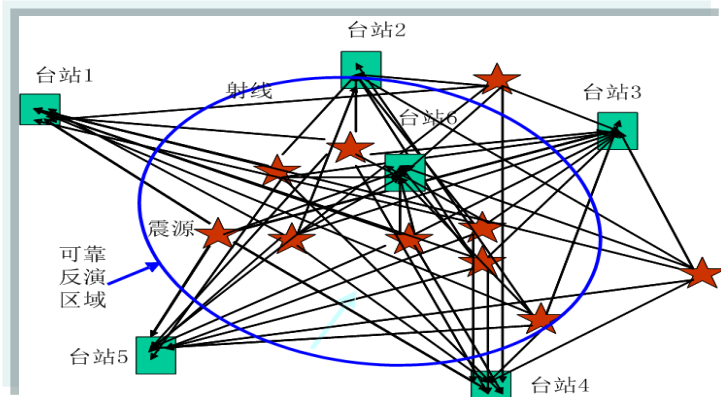
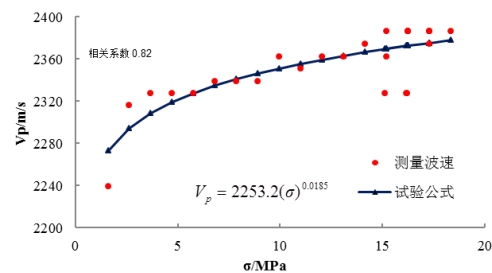
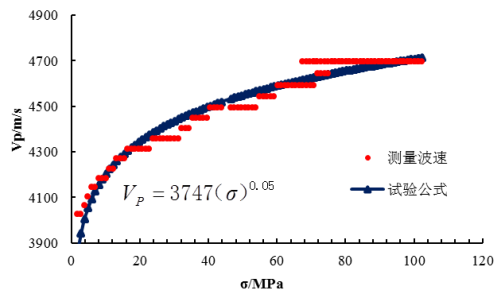
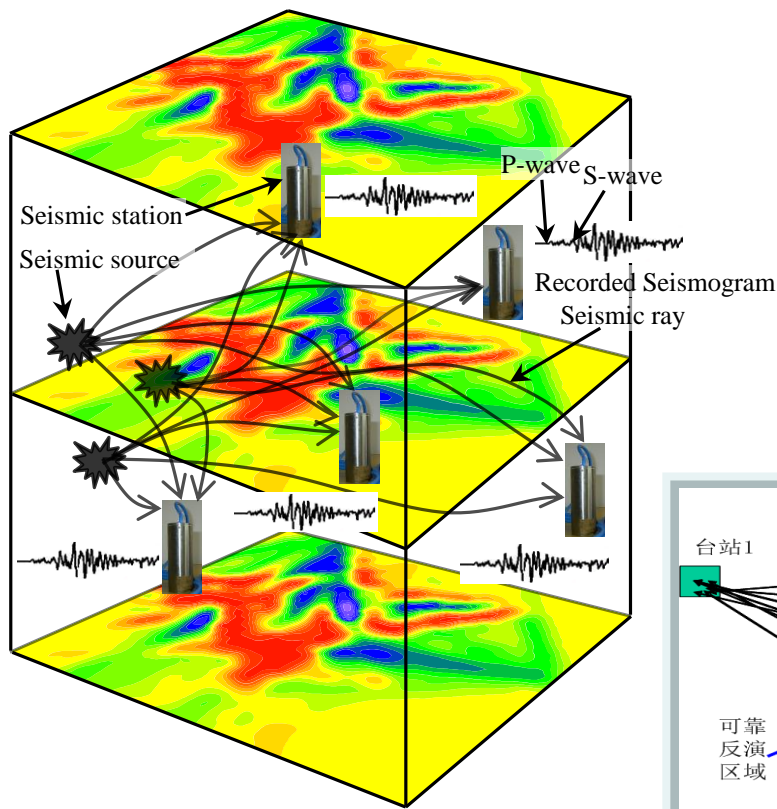


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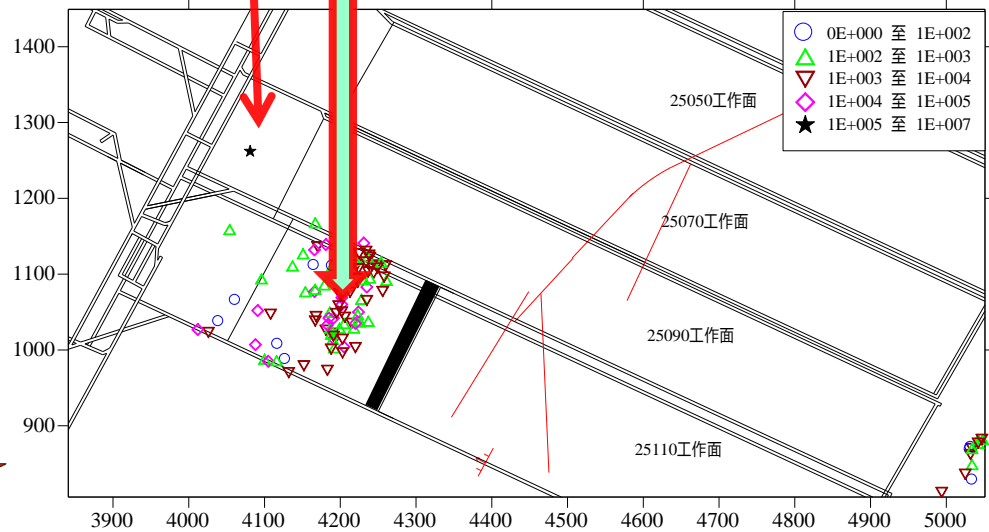


## 震动波 (被动) CT探测 (2011)

$$t_i = \int_{\Gamma_i} \frac{1}{V(x, y, z)} d\vec{x} + t_{i0}$$



20110508—20120607时段



20120608—20120630

山东省科技一等奖

# 5.4) 双震源一体化 CT 探测



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## 双震源一体化CT应力探测技术及装备研发

