

$LD^{-1}L^\top$:

$$i^{\text{th}} \text{row: } \underbrace{\left(\begin{array}{ccccccc} \tilde{c}_{i-m} & 0 & \cdots & 0 & \tilde{b}_{i-1} & \tilde{d}_i & 0 & \cdots & 0 \end{array} \right)}_L \underbrace{\left(\begin{array}{ccc} \cdots & & \emptyset \\ & \frac{1}{\tilde{d}_i} & \\ \emptyset & & \cdots \end{array} \right)}_{D^{-1}} \underbrace{\left(\begin{array}{c} \tilde{c}_{j-m} \\ 0 \\ \vdots \\ 0 \\ \tilde{b}_{j-1} \\ \tilde{d}_j \end{array} \right)}_{L^\top}$$

$$i^{\text{th}} \text{row: } \left(\begin{array}{ccccccc} \tilde{c}_{i-m} & 0 & \cdots & 0 & \tilde{b}_{i-1} & \tilde{d}_i & 0 & \cdots & 0 \\ \emptyset & 1 & & & \tilde{b}_i & \tilde{d}_i & & & \tilde{c}_i \\ & & & & \emptyset & & & & \tilde{b}_{i+(m-1)} \\ & & & & & & & & \tilde{d}_{i+(m-1)} \\ & & & & & & & & 1 \end{array} \right)$$

$$\begin{aligned} \text{row } i, \text{ col } i : & \quad \frac{\tilde{c}_{i-m}^2}{\tilde{d}_{i-m}} + \frac{\tilde{b}_{i-1}^2}{\tilde{d}_{i-1}} + \tilde{d}_i = a_i; \\ \text{row } i, \text{ col } i + 1 : & \quad \tilde{b}_i = b_i; \\ \text{row } i, \text{ col } i + m : & \quad \tilde{c}_i = c_i. \end{aligned}$$