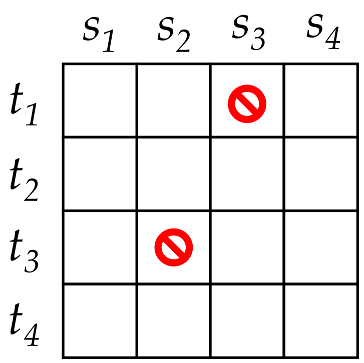
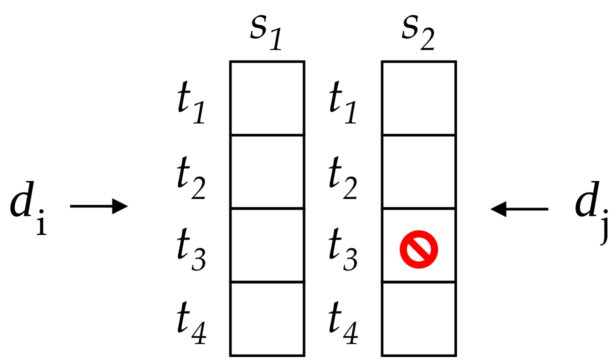
Step 1: Compute covariance matrix from all existing data

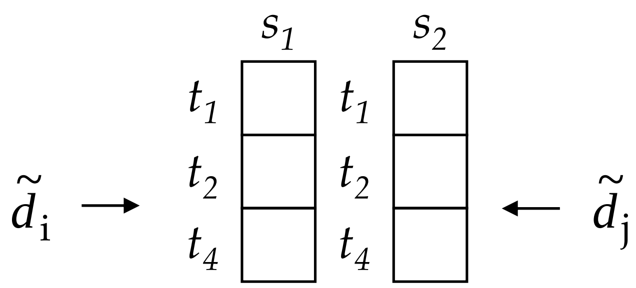


$$C_{ij} = \langle \mathbf{d}_i \mathbf{d}_j^T \rangle = \frac{1}{L-m} \sum_{l=1}^{L-m} \tilde{d}_i(t_l)\tilde{d}_j(t_l),$$

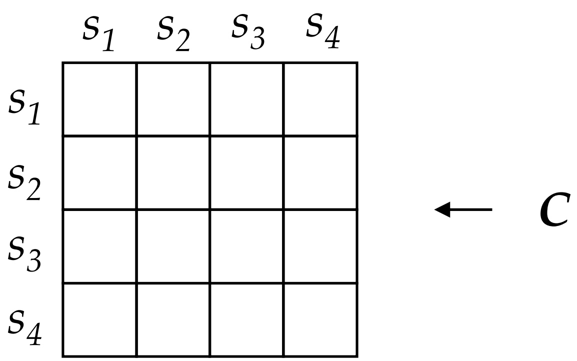
e.g.

Let *i* = 1 and *j* = 2:

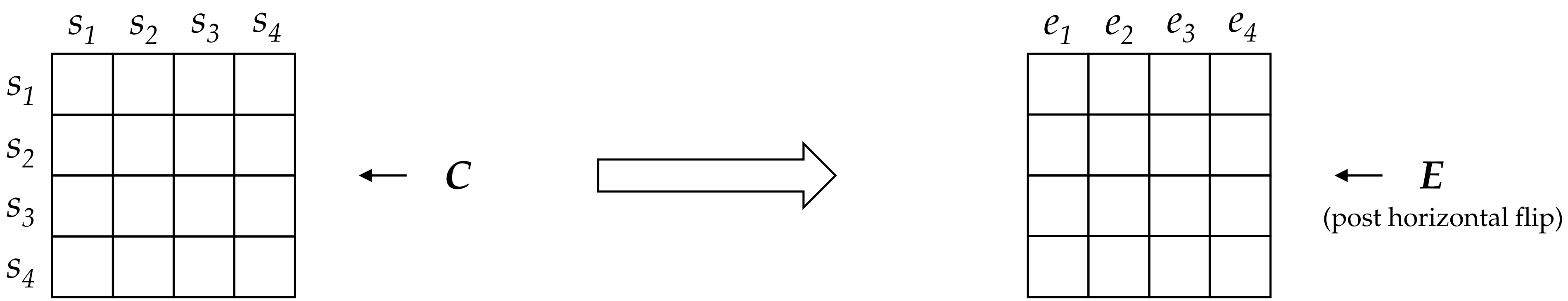




$$C_{1\,2} = [s_1(t_1)s_2(t_1) + s_1(t_2)s_2(t_2) + s_1(t_4)s_2(t_4)]\,/\,3$$



Step 2: Compute eigenvectors of C



in MATLAB, need to fliplr(E), then:
each column in ***E*** is a spatial mode

Step 3: Find the temporal mode

One way would be to ignore all missing data:

$$a_i(t_l) = \tilde{\mathbf{d}}(\mathbf{t}_l)^T \tilde{\mathbf{e}}_i,$$

But instead we calculate a linear combination of multiple modes:

$$\hat{a}_i(t_l) = \sum_{i=1}^{N} (b_i \tilde{\mathbf{d}}(\mathbf{t}_l)^T \tilde{\mathbf{e}}_i),$$

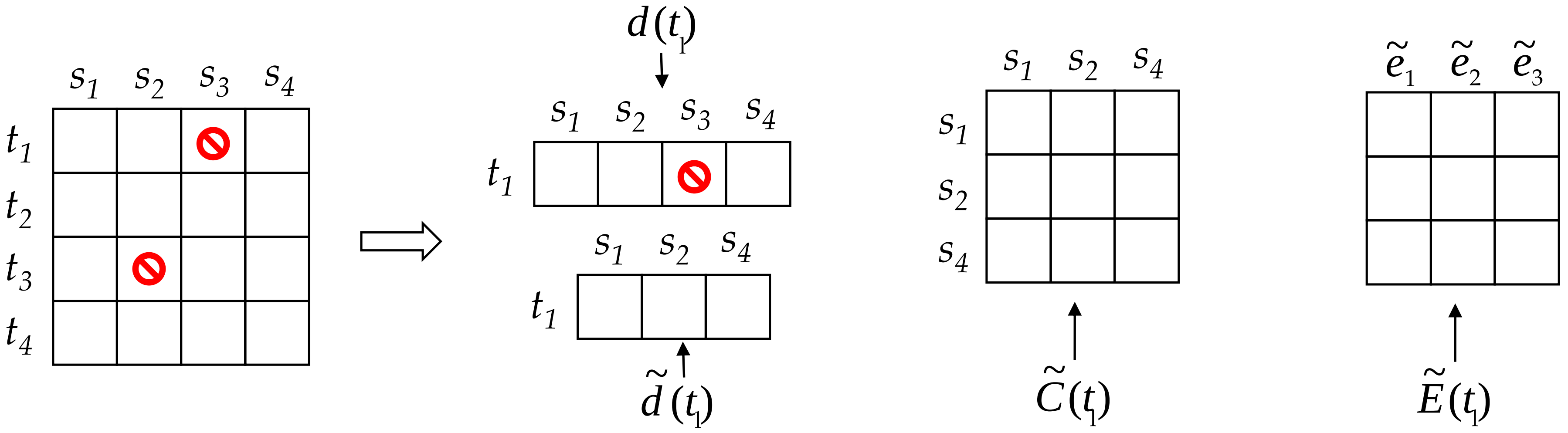
This notation is ambiguous, though:

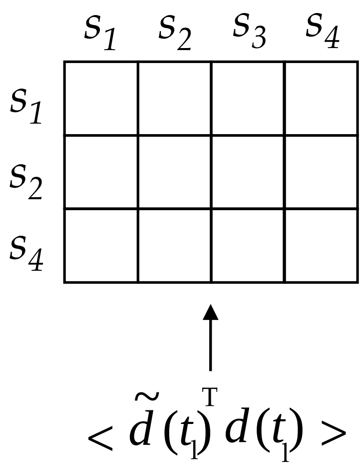
$$\hat{a}_i(t_l) = \sum_{q=1}^{N-m} (b_q \tilde{\mathbf{d}}(\mathbf{t}_l)^T \tilde{\mathbf{e}}_q),$$

where ***N-m*** is the number of non-missing spatial points at time t_l and
i is the EOF mode

Step 4: Compute b vector and amplitude estimate at each temporal point

e.g.
Let *l* = 1





$$\underbrace{\mathbf{b(t_l)}}_{3x1} = \underbrace{(\tilde{E}(t_1)^T \tilde{C}(t_1) \tilde{E}(t_1))^{-1} \tilde{E}(t_1)}_{3x3} \underbrace{< \tilde{d}(t_1)^T d(t_1) >}_{3x4} \underbrace{e_i}_{4x1}$$