

# PeGn624 Homework # 10

- Assigned: 2009-02-06
- Due: 2009-02-13

## 1 Question 1: Expansion

The primary variables are  $P_o$ ,  $S_o$ ,  $T$ . When  $T < T_s$ ,  $S_g = 0$  and  $T_s$  is used as the fourth primary variable. When  $T \geq T_s$ ,  $S_g$  is used as the fourth primary variable.

### 1.1 Part (a): Water Equation

Eq. 1 represents the left-hand-side of the water component equation. Expand the finite difference operators in Eq. 1 in terms of the primary variables for a 1D problem. Collect terms for  $P_o^{n+1}$  and terms which do not contain  $P_o^{n+1}$ .

$$\text{LHSW} = \Delta (T_w^n \xi_w^n X_{w1}^n (\Delta P_w^{n+1} - \gamma_w^n \Delta D)) + \Delta (T_g^n \xi_g^n Y_{w1}^n (\Delta P_g^{n+1} - \gamma_g^n \Delta D)) + \xi_w q_w X_{w1} + \xi_g q_g Y_{w1} \quad (1)$$

### 1.2 Part (b): Oil Equation

Eq. 2 represents the left-hand-side of the oil component equation. Expand the finite difference operators in Eq. 2 in terms of the primary variables for a 1D problem. Collect terms for  $P_o^{n+1}$  and terms which do not contain  $P_o^{n+1}$ .

$$\text{LHSO} = \Delta (T_o^n \xi_o^n X_{o2}^n (\Delta P_o^{n+1} - \gamma_o^n \Delta D)) + \xi_o q_o X_{o2} \quad (2)$$

## 2 Question 2: Blank Matrix

Create a blank  $(4 \times 3) \times (4 \times 3)$  matrix with square cells. Print it so it fills the full page. Bring 10 copies to class on Thursday 2/12 to facilitate taking notes.