$$
\begin{aligned}
c &= 1, 2 && \text{(Condition)}\\
l &= 1, ..., L_c && \text{(ORF)}\\
m &= 1, ..., M_{cl} && \text{(Repeat)}
\end{aligned}
$$

$$y_{clm} \sim \mathrm{N}(e^{\alpha_c + (Z_l + \delta_l \gamma_{cl})}, (e^{\upsilon_c + \nu_l})^{-1})$$

$$
\begin{aligned}
Z_l &\sim \mathrm{N}(Z^p, (e^{\sigma^Z})^{-1}) & \sigma^Z &\sim \mathrm{N}(\eta^Z, \psi^Z)\\
\nu_l &\sim \mathrm{N}(\nu^p, (e^{\sigma^\nu})^{-1}) & \sigma^\nu &\sim \mathrm{N}(\eta^\nu, \psi^\nu)\\
\delta_l &\sim Bern(p)
\end{aligned}
$$

$$\gamma_{cl} = \begin{cases} 0 & \text{if } c = 0;\\ \mathrm{N}(0, (e^{\sigma^\gamma})^{-1}) & \text{if } c = 1. \end{cases} \qquad \sigma^\gamma = \begin{cases} 0 & \text{if } c = 0;\\ \mathrm{N}(\eta^\gamma, (\psi^\gamma)^{-1}) & \text{if } c = 1. \end{cases}$$

$$\alpha_c = \begin{cases} 0 & \text{if } c = 0;\\ \mathrm{N}(\alpha^\mu, \eta^\alpha) & \text{if } c = 1. \end{cases}$$

$$\upsilon_c = \begin{cases} 0 & \text{if } c = 0;\\ \mathrm{N}(\upsilon^p, (e^{\sigma^\upsilon})^{-1}) & \text{if } c = 1. \end{cases} \qquad \sigma^\upsilon \sim \mathrm{N}(\eta^\upsilon, (\psi^\upsilon)^{-1})$$

$$
\begin{aligned}
Z^p &\sim N(Z^\mu, (\eta^{Z,p})^{-1})\\
\nu^p &\sim \mathrm{N}(\nu^\mu, (\eta^{\nu,p})^{-1})\\
\upsilon^p &\sim \mathrm{N}(\upsilon^\mu, (\eta^{\upsilon,p})^{-1})
\end{aligned}
$$

$$y_{clm} \sim \mathrm{N}(e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})}, (e^{\upsilon_c+\nu_l})^{-1})$$
$$Z_l \sim \mathrm{N}(Z^p, (e^{\sigma^Z})^{-1})$$

$$\pi(Z_l|\theta) = \sqrt{\frac{e^{\sigma^Z}}{2\pi}} e^{-\frac{1}{2}(Z_l-Z^p)^2 e^{\sigma^Z}} \prod_{c=1}^{2}\prod_{m=1}^{m_{cl}} \sqrt{\frac{e^{\upsilon_c+\nu_l}}{2\pi}} e^{-\frac{1}{2}(y_{clm}-e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})})^2 e^{\upsilon_c+\nu_l}}$$

Taking logs

$$l\pi(Z_l|\theta) = -\frac{1}{2}(Z_l - Z^p)^2 e^{\sigma^Z} - \sum_{c=1}^{2}\sum_{m=1}^{m_{cl}} \frac{1}{2}(y_{clm} - e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})})^2 e^{\upsilon_c+\nu_l} + C$$

$$y_{clm} \sim \mathrm{N}(e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})}, (e^{\upsilon_c+\nu_l})^{-1})$$
$$\nu_l \sim \mathrm{N}(\nu^p, (e^{\sigma^\nu})^{-1})$$

$$\pi(\nu_l|\theta) = \sqrt{\frac{e^{\sigma^\nu}}{2\pi}} e^{-\frac{1}{2}(\nu_l-\nu^p)^2 e^{\sigma^\nu}} \prod_{c=1}^{2}\prod_{m=1}^{m_{cl}} \sqrt{\frac{e^{\upsilon_c+\nu_l}}{2\pi}} e^{-\frac{1}{2}(y_{clm}-e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})})^2 e^{\upsilon_c+\nu_l}}$$

Taking logs

$$l\pi(\nu_l|\theta) = -\frac{1}{2}(\nu_l - \nu^p)^2 e^{\sigma^\nu} - \sum_{c=1}^{2}\sum_{m=1}^{m_{cl}} \frac{1}{2}(\nu_l - (y_{clm} - e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})})^2 e^{\upsilon_c+\nu_l}) + C$$

$$y_{clm} \sim \mathrm{N}(e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})}, (e^{\upsilon_c+\nu_l})^{-1})$$
$$\delta_l \sim Bern(p)$$

$$\pi(y_{2lm}|, \delta_l = 1, \theta) = (p) \times \prod_{m=1}^{m_{2l}} \sqrt{\frac{e^{\upsilon_2+\nu_l}}{2\pi}} e^{-\frac{1}{2}(y_{2lm}-e^{\alpha_2+(Z_l+\gamma_{2l})})^2 e^{\upsilon_2+\nu_l}}$$
$$\pi(y_{2lm}|, \delta_l = 0, \theta) = (1-p) \times \prod_{m=1}^{m_{2l}} \sqrt{\frac{e^{\upsilon_2+\nu_l}}{2\pi}} e^{-\frac{1}{2}(y_{2lm}-e^{\alpha_2+Z_l})^2 e^{\upsilon_2+\nu_l}}$$

$$
\begin{aligned}
Z_l &\sim \mathrm{N}(Z^p, (e^{\sigma^Z})^{-1}) \\
\sigma^Z &\sim \mathrm{N}(\eta^Z, \psi^Z)
\end{aligned}
$$

$$\pi(\sigma^Z|\theta) = \sqrt{\frac{\psi^Z}{2\pi}} e^{-\frac{1}{2}(\sigma^Z - \eta^Z)^2 \psi^Z} \prod_{l=1}^{L} \sqrt{\frac{e^{\sigma^Z}}{2\pi}} e^{-\frac{1}{2}(Z_l - Z^p)^2 e^{\sigma^Z}}$$

Taking logs

$$l\pi(\sigma^Z|\theta) = -\frac{1}{2}(\sigma^Z - \eta^Z)^2 \psi^Z + \sum_{l=1}^{L} \frac{1}{2}(\sigma^Z - (Z_l - Z^p)^2 e^{\sigma^Z}) + C$$

Similarly for σ^ν

$$l\pi(\sigma^\nu|\theta) = -\frac{1}{2}(\sigma^\nu - \eta^\nu)^2 \psi^\nu + \sum_{l=1}^{L} \frac{1}{2}(\sigma^\nu - (\nu_l - \nu^p)^2 e^{\sigma^\nu}) + C$$

$$
\begin{aligned}
y_{clm} &\sim \mathrm{N}(e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})}, (e^{\upsilon_c+\nu_l})^{-1}) \\
\gamma_{cl} &= \begin{cases} 0 & \text{if } c=0; \\ \mathrm{N}(0,(e^{\sigma^\gamma})^{-1}) & \text{if } c=1. \end{cases}
\end{aligned}
$$

$$\pi(\gamma_{2l}|\theta) = \sqrt{\frac{e^{\sigma^\gamma}}{2\pi}} e^{-\frac{1}{2}(\gamma_{2l})^2 e^{\sigma^\gamma}} \prod_{m=1}^{m_l} \sqrt{\frac{e^{\upsilon_2+\nu_l}}{2\pi}} e^{-\frac{1}{2}(y_{2lm}-e^{\alpha_2+(Z_l+\delta_l\gamma_{2l})})^2 e^{\upsilon_2+\nu_l}}$$

Taking logs

$$l\pi(\gamma_{2l}|\theta) = -\frac{1}{2}(\gamma_{2l})^2 e^{\sigma^\gamma} - \sum_{m=1}^{m_l} \frac{1}{2}(y_{2lm} - e^{\alpha_2+(Z_l+\delta_l\gamma_{2l})})^2 e^{\upsilon_2+\nu_l} + C$$

σ^γ is similar to both σ^Z and σ^ν

$$l\pi(\sigma^\gamma|\theta) = -\frac{1}{2}(\sigma^\gamma - \eta^\gamma)^2 \psi^\gamma + \sum_{m=1}^{m_l} \frac{1}{2}(\sigma^\gamma - (\gamma_l)^2 e^{\sigma^\gamma}) + C$$

$$
\begin{aligned}
y_{clm} &\sim \mathrm{N}(e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})}, (e^{\upsilon_c+\nu_l})^{-1}) \\
\alpha_c &= \begin{cases} 1 & \text{if } c=0; \\ \mathrm{N}(\alpha^\mu,\eta^\alpha) & \text{if } c=1. \end{cases}
\end{aligned}
$$

$$\pi(\alpha_2|\theta) = \sqrt{\frac{\eta^\alpha}{2\pi}} e^{-\frac{1}{2}(\alpha_2-\alpha^\mu)^2\eta^\alpha} \prod_{l=1}^{L} \prod_{m=1}^{m_{2l}} \sqrt{\frac{e^{\upsilon_2+\nu_l}}{2\pi}} e^{-\frac{1}{2}(y_{2lm}-e^{\alpha_2+(Z_l+\delta_l\gamma_{2l})})^2 e^{\upsilon_2+\nu_l}}$$

Taking logs

$$l\pi(\alpha_2|\theta) = -\frac{1}{2}(\alpha_2 - \alpha^\mu)^2\eta^\alpha - \sum_{l=1}^{L}\sum_{m=1}^{m_{2l}} \frac{1}{2}(y_{2lm} - e^{\alpha_2+(Z_l+\delta_l\gamma_{2l})})^2 e^{\upsilon_2+\nu_l} + C$$

$$
\begin{aligned}
y_{clm} &\sim \mathrm{N}(e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})}, (e^{\upsilon_c+\nu_l})^{-1}) \\
\upsilon_c &\sim \mathrm{N}(\upsilon^p, (e^{\sigma^\upsilon})^{-1})
\end{aligned}
$$

$$\pi(\upsilon_c|\theta) = \sqrt{\frac{e^{\sigma^\upsilon}}{2\pi}} e^{-\frac{1}{2}(\upsilon_c-\nu^p)^2 e^{\sigma^\upsilon}} \prod_{l=1}^{L}\prod_{m=1}^{m_{cl}} \sqrt{\frac{e^{\upsilon_c+\nu_l}}{2\pi}} e^{-\frac{1}{2}(y_{clm}-e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})})^2 e^{\upsilon_c+\nu_l}}$$

Taking logs

$$l\pi(\upsilon_c|\theta) = -\frac{1}{2}(\upsilon_c - \upsilon^p)^2 e^{\sigma^\upsilon} + \sum_{l=1}^{L}\sum_{m=1}^{m_{cl}} \frac{1}{2}(\upsilon_l - (y_{clm} - e^{\alpha_c+(Z_l+\delta_l\gamma_{cl})})^2 e^{\upsilon_c+\nu_l}) + C$$

σ^{υ} is similar to both σ^{Z} and σ^{ν}

$$l\pi(\sigma^{\upsilon}|\theta) = -\frac{1}{2}(\sigma^{\upsilon}-\eta^{\upsilon})^2\psi^{\upsilon} + \sum_{c=1}^{2}\frac{1}{2}(\sigma^{\upsilon}-(\upsilon_c-\upsilon_p)^2 e^{\sigma^{\upsilon}}) + C$$

$$Z_l \sim \mathrm{N}(Z^p, \left(e^{\sigma^Z}\right)^{-1})$$
$$Z^p \sim N(Z^\mu, \left(\eta^{Z,p}\right)^{-1})$$
$$\pi(Z^p|\theta) = \sqrt{\frac{\eta^{Z,p}}{2\pi}} e^{-\frac{1}{2}(Z^p - Z^\mu)^2 \eta^{Z,p}} \prod_{l=1}^{L} \sqrt{\frac{e^{\sigma^Z}}{2\pi}} e^{-\frac{1}{2}(Z_l - Z^p)^2 e^{\sigma^Z}}$$

Taking logs

$$l\pi(Z^p|\theta) = -\frac{1}{2}(Z^p - Z^\mu)^2 e^{\sigma^Z} - \sum_{l=1}^{L} \frac{1}{2}(Z_l - Z^p)^2 e^{\sigma^Z} + C$$

Similarly for ν^p

$$l\pi(\nu^p|\theta) = -\frac{1}{2}(\nu^p - \nu^\mu)^2 e^{\sigma^\nu} - \sum_{l=1}^{L} \frac{1}{2}(\nu_l - \nu^p)^2 e^{\sigma^\nu} + C$$

And also similarly for υ^p

$$l\pi(\upsilon^p|\theta) = -\frac{1}{2}(\upsilon^p - \upsilon^\mu)^2 e^{\sigma^\upsilon} - \sum_{l=1}^{L} \frac{1}{2}(\upsilon_l - \upsilon^p)^2 e^{\sigma^\upsilon} + C$$