Table A: A list of possible external mode open boundary conditions. In the formulations, $c_e = \sqrt{gH}$. The variable *BC* is user specified and may be equated to the left sides of (A-1) - (A-3) where $\overline{U}$ and η are known *a priori*. The right sides of (A-4) and (A-5) need not necessarily be zero. This table greatly augmented from the original by Peter Holloway (School of Geography and Oceanography, University College, University of New South Wales, Australian Defence Force Academy, Australia) and edited by George Mellor. The table does not exhaust the list of possible boundary conditions. Please report errors. (Tables included in POM Users Guide since July 1998)

Formula	**Boundary**	**Code**
Inflow condition: $D\overline{U} = BC$ (A -1)	EAST	UAF(IM,J) = 2*BC(J)/(H(IM,J)+ELF(IM,J) + H(IMM1,J) + ELF(IMM1,J)) ELF(IM,J) = ELF(IMM1,J) VAF(IM,J) = set[1]
	WEST	UAF(2,J) = 2*BC(J)/(H(1,J)+ELF(1,J) + H(2,J)+ELF(2,J)) ELF(1,J) = ELF(2,J) VAF(1,J) = set
	NORTH	VAF(I,JM) = 2*BC(I)/(H(I,JM)+ELF(I,JM) + H(I,JMM1) + ELF(I,JMM1)) ELF(I,JM) = ELF(I,JMM1) UAF(I,JM) = set
	SOUTH	VAF(I,2) = 2*BC(I)/(H(I,1)+ELF(I,1) + H(I,2)+ELF(I,2)) ELF(I,1) = ELF(I,2) UAF(I,1) = set
Elevation condition: $\eta = BC$ (A - 2)	EAST	ELF(IMM1,J) = BC(J) ELF(IM,J) = ELF(IMM1,J) cosmetic UAF(IM,J) = UAF(IMM1,J) VAF(IM,J) = set
	WEST	ELF(2,J) = BC(J) UAF(2,J) = UAF(3,J) VAF(1,J) = set
	NORTH	ELF(I,JMM1) = BC(I) ELF(I,JM) = ELF(I,JMM1) cosmetic VAF(I,JM) = VAF(I,JMM1) UAF(I,JM) = set
	SOUTH	ELF(I,2) = BC(I) VAF(I,2) = VAF(I,3) UAF(I,1) = set

[1] We use "set" to denote the prescription for the along-boundary component of velocity. If it is a known value then that value can be used. More often it is not known and the value , 0, is used.

Radiation: $H\overline{U} \pm c_e \eta = BC$ [2] (A-3)	EAST	UAF(IM,J) = SQRT(GRAV/H(IMM1,J))* EL(IMM1,J) + BC(J) ELF(IM,J) = ELF(IMM1,J) VAF(IM,J) = set
	WEST	UAF(2,J) = - SQRT(GRAV/H(2,J))* EL(2,J)+BC(J) ELF(1,J) = ELF(2,J) VAF(1,J) = set
	NORTH	VAF(I,JM) = SQRT(GRAV/H(I,JMM1))* EL(I,JMM1) + BC(I) ELF(I,JM) = ELF(I,JMM1) UAF(I,JM) = set
	SOUTH	VAF(I,2) = - SQRT(GRAV/H(I,2))* EL(I,2)+BC(I) ELF(I,1) = ELF(I,2) UAF(I,1) = set
Radiation: $\frac{\partial \overline{U}}{\partial t} \pm c_e \frac{\partial \overline{U}}{\partial x} = 0$ (A-4)	EAST	GAE = DTE*SQRT(GRAV*H(IM,J))/DX(IM,J) UAF(IM,J) = GAE*UA(IMM1,J) + (1.-GAE)*UA(IM,J) ELF(IM,J) = ELF(IMM1,J) VAF(IM,J) = set
	WEST	GAE = DTE*SQRT(GRAV*H(2,J))/DX(2,J) UAF(2,J) = GAE*UA(3,J) + (1.-GAE)*UA(2,J) ELF(1,J) = ELF(2,J) VAF(1,J) = set
	NORTH	GAE = DTE*SQRT(GRAV*H(I,JM))/DY(I,JM) VAF(I,JM) = GAE*VA(I,JMM1) + (1.-GAE)*VA(I,JM) ELF(I,JM) = ELF(I,JMM1) UAF(I,JM) = set
	SOUTH	GAE = DTE*SQRT(GRAV*H(I,2))/DY(I,2) VAF(I,2) = GAE*VA(I,3) + (1.-GAE)*VA(I,2) ELF(I,1) = ELF(I,2) UAF(I,1) = set

[2] The boundary forcing can be set to known values approximately balancing the left side; e. g., on the east BC(J) = UABE(J)-SQRT(GRAV/H(IMM1,J))* ELE(J) where UABE(J) and ELE(J) are specified values.

Radiation: $\frac{\partial \eta}{\partial t} \pm c_e \frac{\partial \eta}{\partial x} = 0$ (A-5)	EAST	GAE = DTE*SQRT(GRAV*H(IMM1,J))/DX(IMM1,J) ELF(IMM1,J) = GAE*EL(IMM2,J) + (1.-GAE) *EL(IMM1,J) ELF(IM,J) = ELF(IMM1,J) UAF(IM,J) = UAF(IMM1,J) VAF(IM,J) = set
	WEST	GAE = DTE*SQRT(GRAV*H(2,J))/DX(1,J) ELF(2,J) = GAE*EL(2,J) + (1.-GAE)*EL(1,J) UAF(2,J) = UAF(3,J) VAF(2,JM) = set
	NORTH	GAE = DTE*SQRT(GRAV*H(I,JMM1))/DY(I,JMM1) ELF(I,JMM1) = GAE*EL(I,JMM2) + (1.-GAE) *EL(I,JMM1) ELF(I,JM) = ELF(I,JMM1) VAF(I,JM) = VAF(I,JMM1) set UAF(I,JM)
	SOUTH	GAE = DTE*SQRT(GRAV*H(I,2))/DY(I,2) ELF(I,2) = GAE*EL(I,2) + (1.-GAE)*EL(I,1) VAF(I,2) = VAF(I,3) set UAF(I,1)
Cyclic (A-6)	EAST (I=IM)	ELF(IM,J) = ELF(3,J) UAF(IM,J) = UAF(3,J) VAF(IM,J) = VAF(3,J)
	WEST (I=1)	ELF(1,J) = ELF(IMM2,J) ELF(2,J) = ELF(IMM1,J) UAF(2,J)=UAF(IMM1,J) VAF(2,J)=VAF(IMM1,J)
	NORTH (J=JM)	ELF(I,JM) = ELF(I,3) UAF(I,JM) = VAF(I,3) VAF(I,JM) = VAF(I,3)
	SOUTH (J=1)	ELF(I,1) = ELF(I,JMM2) ELF(I,2) = ELF(I,JMM1) UAF(I,2)=UAF(I,JMM1) VAF(I,2)=VAF(I,JMM1)

TABLE B: A list of internal mode variables to be set on open lateral boundaries and example boundary conditions. Note that UF and VF are used for the forward time step of U and V, T and S, and Q2 and Q2L. The variables TBE, TBW, TBN, TBS (and similar variables for salinity) are supplied by the user

Formula	**Boundary**	**Code**
Inflow condition: $U = BC$ (B-1)	EAST	UF(IM,J,K) = BC(J,K) VF(IM,J,K) = set
	WEST	UF(2,J,K) = BC(J,K) VF(1,J,K) = set
	NORTH	VF(I,JM,K) = BC(I,K) UF(I,JM,K) = set
	SOUTH	VF(I,2,K) = BC(I,K) UF(I,1,K) = set
Radiation: $\frac{\partial U}{\partial t} \pm c_i \frac{\partial U}{\partial x} = 0$ (B-2)	EAST	GAI = SQRT(H(IM,J)/HMAX)[3] UF(IM,J,K) = GAI*U(IMM1,J,K) + (1.-GAI)*U(IM,J,K) VF(IM,J,K) = set
	WEST	GAI = SQRT(H(2,J)/HMAX) UF(2,J,K) = GAI*U(3,J,K) + (1.-GAI)*U(2,J,K) VF(1,J,K) = set
	NORTH	GAI = SQRT(H(I,JM)/HMAX) VF(I,JM,K) = GAI*V(I,JMM1,K) + (1.-GAI)*V(I,JM,K) UF(I,JM,K) = set
	SOUTH	GAI = SQRT(H(I,2)/HMAX) VF(I,2,K) = GAI*V(I,3,K) + (1.-GAI)*V(I,2,K) UF(I,1,K) = set

[3] This is a rough approximation to $c_e \Delta t / \Delta x$ and assumes that Δt has been set such that $(c_e)_{\max} \Delta t / \Delta x$ is near unity. A more sophisticated, but, sometimes prone to noisy output, is Orlanski's scheme where c_e, or GAI itself, is determined by solving for the GAI at the next inboard location; e.,g., GAI = (UF(IM,J,K)-U(IM,J,K))/(U(IMM1,J,K)-U(IM,J,K)). GAI should be constrained according to $0 \le \text{GAI} \le 1$.

Upstream advection on T or S: $\frac{\partial T}{\partial t} + U\frac{\partial T}{\partial x} = 0$ (B-3)	EAST	UF(IM,J,K) = T(IM,J,K) -DTI/(DX(IM,J)+DX(IMM1,J)) * ((U(IM,J,K) + ABS(U(IM,J,K))) * (T(IM,J,K)-T(IMM1,J,K)) + (U(IM,J,K) - ABS(U(IM,J,K))) * (TBE(J,K)-T(IM,J,K)))
	WEST	UF(1,J,K) = T(1,J,K) -DTI/(DX(1,J)+DX(2,J)) * ((U(1,J,K) + ABS(U(1,J,K))) * (T(1,J,K)-TBW(J,K)) + (U(1,J,K) - ABS(U(1,J,K))) * (T(2,J,K)-T(1,J,K)))
	NORTH	UF(I,JM,K) = T(I,JM,K) -DTI/(DY(I,JM)+DY(I,JMM1)) * ((V(I,JM,K) + ABS(V(I,JM,K))) * (T(I,JM,K)-T(I,JMM1,K)) + (V(I,JM,K) - ABS(V(I,JM,K))) * (TBN(I,K)-T(I,JM,K)))
	SOUTH	UF(I,1,K) = T(I,1,K) -DTI/(DY(I,1)+DY(I,2)) * ((V(I,1,K) + ABS(V(I,1,K))) * (T(I,1,K)-T(I,2,K)) + (V(I,1,K) - ABS(V(I,1,K))) * (TBS(I,K)-T(I,1,K)))
Cyclic (B-4)		Much the same as (A - 6) except replace UAF with UF, etc. and T, S, Q2 and Q2L are handled similar to ELF.