

# Supplementary Material to:

## The UKC3 regional coupled environmental prediction system

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### S1 Introduction

20 This supplementary material to the main paper is designed to help users of the UKC3 system in configuring their systems  
correctly.

The configurations are made available to registered researchers as rose suites on the <https://code.metoffice.gov.uk/trac/roses->  
25 [u](https://code.metoffice.gov.uk/trac/roses-) repository, following the relevant suite id for a given configuration listed and linked to in Table 2.

### S2 Example rose namelists for UKC3 configurations of MetUM, JULES, NEMO and WAVEWATCH III namelists

30 The provided text file gmd-2018-ukc3-namelists.txt includes a set of MetUM, JULES, NEMO and WAVEWATCH III rose  
namelists for a UKC3 simulation run at MetUM code base vn10.6, JULES vn4.7, NEMO vn3.6 (r6632), WAVEWATCHIII  
(vn4.18).

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S3 Code modifications applied for UKC3

A number of code adaptations were required in order to develop the UKC3 configuration, and associated UKA3, UKL3, UKO3 and UKW3 component and control configurations. These are summarised below. All code modifications were implemented as distinct branches from the baseline code (e.g. trunk). These branches are merged to form a single code set as part of the fcm\_make configuration build process within each rose suite prior to running. For convenience, a copy of the merged code for each component is made available to registered researchers to support collaboration, as described in the main paper (Table 1). The following tables provide supplementary detail on the underpinning code branches used for UKC3. All are also accessible to registered researchers, although the authors would recommend either working with the provided copy of the merged code or preferably making use of the rose suites described which include automated extraction, merging and compilation of the relevant codes from the various repositories using the fcm\_make functionality.

Met Office Unified Model branch name	Code revision	Purpose
ukeputils/trunk/gmd-2018-???/uka3/um	<a href="#">UKA3</a>	Merged copy of UKA3 MetUM code
<i>Contains merge of:</i>		
vn10.6 trunk	<a href="#">29689</a>	Root MetUM vn10.6 code base, tagged um10.6
adrianlock/vn10.6_graup_to_jules	<a href="#">30873</a>	Update application of graupel diagnostic in JULES
juanmcastillo/vn10.6_non_ctile_coupling	<a href="#">41157</a>	Ensure valid coupling where coastlines not overlap
juanmcastillo/vn10.6_ukep_rivrouting	<a href="#">39329</a>	Enable relevant river routing diagnostics in JULES
juanmcastillo/vn10.6_AtmWaveOasis	<a href="#">40447</a>	Add wave coupling capability to MetUM
juanmcastillo/vn10.6_oasis-noncoupled	<a href="#">39979</a>	Compile MetUM with coupling flags if not coupled
juanmcastillo/vn10.6_l_param_conv-bug	<a href="#">40119</a>	Fix issue with treatment of convective snow in coupler

**Table S1: Summary of Met Office Unified Model code branches merged and used in the UKA3 and UKC3 system, containing relevant adaptations from the version 10.6 baseline code. All model codes are accessible via <https://code.metoffice.gov.uk/trac/um/wiki>. Registered users can directly access the copy of the merged code provided and each separate code branch listed at the revision used in UKC3 by following the direct code revision links provided in the Table.**

JULES land surface model branch name	Code revision	Purpose
ukeputils/trunk/gmd-2018-???/uka3/jules	<a href="#">UKL3</a>	Merged copy of UKA3/UKL3 JULES code
<i>Contains merge of:</i>		
vn4.7 trunk	<a href="#">5320</a>	Root MetUM vn4.7 code base, tagged um10.6
adrianlock/vn4.7_graup_to_jules	<a href="#">5769</a>	Update application of graupel diagnostic in JULES
juanmcastillo/vn4.7_ukep_hydrol	<a href="#">10045</a>	Apply Martinez et al. (2018) recommendations
juanmcastillo/vn4.7_ukep_river_fixes	<a href="#">10052</a>	Apply trunk code modification to routing not at vn4.7
juanmcastillo/vn4.7_AtmWaveOasis	<a href="#">9190</a>	Implement wave coupling within surface exchange
johnmedwards/vn4.7_debug_surfex2	<a href="#">9388</a>	Modify iteration initial condition for surface exchange

**Table S2: Summary of JULES code branches merged and used in the UKA3/UKL3 and UKC3 system, containing relevant adaptations from the version 4.7 baseline code. All model codes are accessible via <https://code.metoffice.gov.uk/trac/jules/wiki>. Registered users can directly access the copy of the merged code provided and each separate code branch listed at the revision used in UKC3 by following the direct code revision links provided in the Table.**

NEMO ocean model branch name	Code revision	Purpose
ukeputils/trunk/gmd-2018-???/uko3/nemo	<a href="#">UKO3</a>	Merged copy of UKO3 NEMO code
<i>Contains merge of:</i>		
vn3.6 trunk	<a href="#">6232</a>	Root NEMO vn3.6 code revision used for UKO3
UKMO/AMM15_v3_6_STABLE_package	<a href="#">8918</a>	Updates t o vn3.6 for shelf seas configuration
UKMO/r6232_CO6_CO5_zenv_pomsdwl	<a href="#">8412</a>	Enable back compatibility with CO5 configuration
UKMO/r6232_hadgem3_mct	<a href="#">7457</a>	Add OASIS-MCT compatibility
UKMO/r6232_hadgem3_cplseq	<a href="#">7460</a>	Set the required order of coupling fields
r6232_hadgem3_cplfld	<a href="#">7463</a>	Treat non-standard aspects of atmospheric coupling
UKMO/r6232_sst_landsea_cpl	<a href="#">7466</a>	Distinguish NEMO land SST values for coupling
UKMO/r6232_HZG_WAVE-coupling	<a href="#">8917</a>	Enable coupling of variables with wave model
UKMO/r6232_rnf_cplmask	<a href="#">9283</a>	Apply river discharge coupling over a sub-domain

**Table S3: Summary of NEMO code branches merged and used in the UKO3 and UKC3 system, containing relevant adaptations from the baseline trunk code at version 3.6 (revision 6232). Model codes are accessible via <http://www.nemo-ocean.eu>. Registered users can directly access the copy of the merged code provided and each separate code branch listed at the revision used in UKC3 by following the direct code revision links provided.**

NEMO compilation keys used in UKC3 and UKO3	
key_zdfgls	GLS generic length scale vertical mixing
key_ldfslp	Lateral diffusion
key_dynspg_ts	Split-explicit free surface
key_vectopt_loop	Inner loop index order
key_bdy	Unstructured open boundary conditions
key_tide	Tidal potential forcing
key_vvl	Variable volume non-linear free surface
key_shelf	Implement Met Office shelf seas flux forcing
key_harm_ana	Calculate harmonic analysis

**Table S4: Summary of NEMO compilation keys used in the UKC3 system.**

WAVEWATCH III branch name	Code revision	Purpose
ukeputils/trunk/gmd-2018-??/ukw3	<a href="#">UKW3</a>	Copy of UKW3 WAVEWATCH III code
<i>Contains:</i>		
WW3v4/branches/dev/frhl/r966_ww3v4_ukep	<a href="#">1782</a>	New implementation of wave coupling to A and O code

**Table S5: Summary of WAVEWATCH III code branch used in the UKC3 system, containing relevant adaptations from the baseline trunk code at version 4.18. This code can be shared with registered users of WAVEWATCHIII, with further details available at <http://polar.ncep.noaa.gov/waves/wavewatch/>.**

WAVEWATCH III compilation switches used in UKC2 and UKW2			
ST3	WAM 4 and variants source term package	RTD	Rotated coordinate system
STAB3	Stability correction (not invoked)	WNT1	Linear wind speed interpolation in time
NL1	Discrete interaction approximation	CRT1	Linear current interpolation in time
BT1	JONSWAP bottom friction formulation	WNX1	Approx. linear wind speed interpolation in space
DB1	Battjes-Janssen depth-induced breaking	CRX1	Approx. linear current interpolation in space
TR0	No triad interactions	FLX0	Flux computation included in source terms
BS0	No bottom scattering	RWND	Correct wind speeds for current velocity
XX0	No supplemental source terms	REF0	No source term for reflection
LN1	Cavaleri and Malanotte-Rizzoli linear input	PR3/UNO	Second order propagation scheme

**Table S6: Summary of WAVEWATCH III compile switches used in the UKC3 system.**