

UNIFIED MODEL DOCUMENTATION PAPER NO D7

TEST DIAGNOSTICS FOR OUTPUT

by

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19th February 1993

Model Version 3.1

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| Modification Record | | |
|----------------------------|---------------|-------------------------|
| Document version | Author | Description..... |
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1. INTRODUCTION

There are many users outside the Unified Model system who need to access UM output files. The route between generation of data within the model to a final output device can be varied and tortuous, with a number of interfaces and conversion routines for different machines. Experience has shown that difficulties can arise in reading UM files. Gross errors are an annoyance but are usually quickly found and cured. Subtle errors are more serious: they can yield plausible datasets upon which subsequent work can be based and wasted. Both the generation of output data within the model and the access routines of output devices are subject to change; there is a need for regular checking of the output mechanisms.

Dummy UM model fields have been created for this purpose based on an analytic function that can also be generated locally and checked against the fields accessed. The function required is arbitrary and so a simple form has been selected:

$$\text{value} = A*(90.0 + \text{latitude}) + B*\text{longitude} + C*\text{level} + D*\text{time} \tag{1}$$

where:

latitude (90. to -90.), longitude (0. to 360.) are actual positions in degrees, which are real, possibly fractional, numbers,

level is pressure level in mb or model level (1,2,etc), and

time is forecast hours after the analysis i.e. T + nn

- and
- A = 1.0
 - B = 1.0E2
 - C = 1.0E3
 - D = 1.0E4

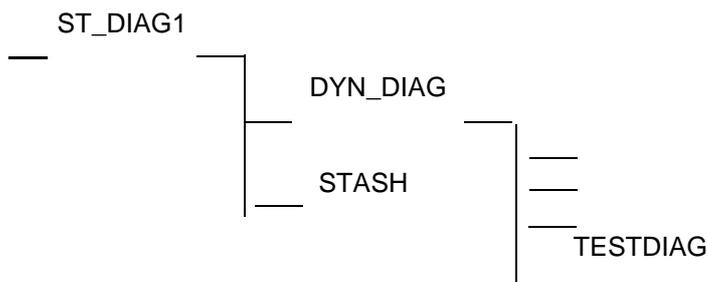
This function is simple to code, always positive and values can be easily recognised for a range of choices of level and time. Clearly, since each value is converted into a 32 bit number on translation to a HDS fieldsfile, it is not possible to retain enough information that all 4 parameters can be uniquely retrieved from this function. Hence it will not be possible to retrieve e.g. a field of latitude. It will instead be necessary to generate the analytic dummy field locally and compare with UM values.

Four types of test diagnostic field have been chosen to offer a representative sample of model output; all fields are calculated and output as real values:

- diagnostic 1: a single level field at θ points (B-grid);
- diagnostic 2: a single level field at u-v points (B-grid);
- diagnostic 3: a multi-level field on pressure levels at θ points (B-grid);
- diagnostic 4: a multi-level field on model levels at θ points (B-grid).

2. CODING TEST DIAGNOSTICS - PROGRAM STRUCTURE

Program structure



Space for model and pressure levels for output of test diagnostics is included in ST_DIAG1 and

passed down to DYN_DIAG, which sets up STASH flags, lists and output arrays for passing into STASH. The diagnostics are calculated under STASH flags so that each of the 4 can be calculated independently.

Structure of TESTDIAG:

1. Calculate diagnostic 1
 - 1a Find equatorial latitudes, longitudes for all u-v points
 - 1b Convert to actual latitude, longitudes if ELF grid
 - 1c Calculate value from (1) [level = 0]

2. Calculate equatorial latitudes, longitudes if any diagnostic 2-4 required
 - 2a Find equatorial latitudes, longitudes for all θ points
 - 2b Convert to actual latitude, longitudes if ELF grid
 - 2c Calculate value from (1) [level = 0]

3. Calculate diagnostic 3
 - Calculate value from (1) [level = pressure level (mb)]

4. Calculate diagnostic 4
 - Calculate value from (1) [level = model level]

3. CODES ASSIGNED TO TEST DIAGNOSTICS 1 - 4

Assignments for test diagnostics:

| TITLE | STASH CODE | PP CODE | MET 0 8 CODE |
|-------------------------------------|------------|---------|--------------|
| Test field on uv grid -single level | (15,231) | 144 | 180 |
| Test field on th grid -single level | (15,232) | 145 | 181 |
| Test field on th grid -press levels | (15,233) | 146 | 182 |
| Test field on th grid -model levels | (15,234) | 147 | 183 |