

## ***Interactive comment on “Coupling technologies for Earth System Modelling” by S. Valcke et al.***

### **Anonymous Referee #2**

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This paper addresses the particularly pertinent issue of just what coupling technologies are currently available as the use of separate couplers and MPMD (multiple program multiple data) coupled models has become a mainstream activity in ES modelling in recent years. As the limits of existing systems are reached, this paper should assist as essential reading in informing development of new and evolution of existing ESM strategies.

It would be useful to mention issues relating to traceability and reproducibility of each approach. i.e. it is often important to be able to demonstrate the provenance and integrity of results from ESMs. This can be hampered, for example, by an inability to reproduce results due to parallel computation operations, or by the absence of details about regridding weights (e.g. if those weights are calculated and held in memory at run time rather than being available for inspection outside of the model.)

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Having mentioned the "3%" cost relating to ESMF, it would be useful to be able to compare performance and overheads of the various other approaches, if such figures exist, though I appreciate that it is unlikely that directly comparable figures currently exist for this purpose.

Specific comments:

ESMF, page 1990, line 23. Could the term "fully parallel" be expanded or explained? i.e. is the word "fully" necessary? If not, it may lead the reader to surmise that there might also exist a solution which is "partially parallel" as well as one which is "non-parallel".

ESMF, page 1991, line 15. 3% of runtime is not necessarily "negligible". It may be considered "acceptably small" for such a potentially complex task compared with other model component costs, but, given the potential vast amount of computer resources involved in ESMs, extensive optimisation effort is often given to speeding up models by fractions of a percent.

OASIS3, page 1996, line 16. Worth pointing out that the official distribution of SCRIP has remained largely undeveloped since 1999 and that it has various known problems which have partly been addressed within a local copy of SCRIP which forms part of the OASIS3 source (and other versions outside of OASIS3.)

MCT, page 1997, line 12. Unsure what is meant by "parallel data movement". Does this mean "parallel coupling field exchanges"?

MCT, page 1997, line 19. Unsure what is meant by "virtual linearization".

BFG, page 1999, line 29 and page 2000, line 2000. References to the now discontinued OASIS4 may lead the reader to conclude that OASIS4 is still of potential interest. It would be better to remove references to OASIS4 and/or replace with "OASIS".

BFG, page 2000, line 22-24, the final sentence needs rewriting or removing (the "Finally" and "we" are out of context for this document.)

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**GMDD**

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