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Appalachian-style multi-terrane Wilson cycle model for the assembly of South China

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Lin et al. (2018) propose a model of Proterozoic-Mesozoic evolution of the South China block (SCB) involving West and East Cathaysia separated by the Northwest Fujian fault. They assume a northeastward translation of East Cathaysia after an Early Paleozoic orogeny due to the collision of West Cathaysia with a “proposed terrane”. This model ignores most of the available, robust field data.

Early Paleozoic Sedimentation

Several works document the sedimentological transition from Yangtze to Cathaysia (e.g., Wang et al., 2010; Shu et al., 2014, 2015). Overlying the several-kilometer-thick silicoclastic series of the Neoproterozoic Nanhua rift, the Cambrian-Ordovician deposits show, from northwest to southeast, a progressive facies evolution within a single southeastward deepening basin developed throughout Cathaysia. Though deposited in a sea, the Early Paleozoic formations were not floored by oceanic crust but by a thinned continental crust, as shown also by the bimodal alkaline magmatism.

The Early Paleozoic Orogeny (EPO)

The EPO received a great deal of attention in the past decade (e.g., Faure et al., 2009; Charvet et al., 2010; Li et al., 2010; Wang et al., 2013; Shu et al., 2014, 2015; Xu et al., 2016). Northwest-verging folds occur to the north of the Jiangshan-Shaoxing fault. South of it, structural studies document the unicity of Cathaysia with a progressive decrease of deformation and metamorphism from northwest to southeast. The synmetamorphic north-south stretching lineation and related kinematics, and fold vergence observed in the pre-Devonian rocks, show everywhere a consistent top-to-the-southeast sense of shear. As usual in orogens, the lower plate is the most buried one, with ductile shearing, and metamorphism. The pre-Devonian features of the SCB can easily be explained by this scheme. Thus the geodynamic sketch proposed in Lin et al.'s figure 6D for the 460–420 Ma period is totally at odds with field data. The Chen Cai metagabbro is not an ophiolitic relic, but a Neoproterozoic intraplate rock metamorphosed at ca 450 Ma. This mafic restite, enclosed in Paleozoic migmatites, is not a block-in-matrix sequence of an accretionary complex. An intracontinental tectonics is widely acknowledged for the EPO (cf. the above references). A collisional model requiring arc magmatism, ophiolitic mélange, and high-pressure metamorphism is not supported by any data. In the present knowledge, the closure of an intracontinental rift is the model that considers all the geological features of the SCB.

The Northwest Fujian Fault (NWFF)

The NWFF is postulated as a major boundary between West and East Cathaysia. Its location, kinematics, amount of displacement, and timing are not provided by Lin et al. The NWFF, if postdating the Triassic orogeny, is likely Mesozoic. Northeast-southwest-striking faults are widespread in southeast China, but wrenching has been widely overestimated. For instance, the sinistral offset was only a few kilometers in the Changle-Nan'ao belt (Wei et al. 2015). The similarity of Paleozoic series exposed on both sides of the NWFF invalidates a large displacement. Thus, an offset of hundreds of kilometers is unlikely.

The Middle Triassic Orogeny

Triassic tectonics is well documented in the SCB (e.g., Faure et al., 2016, and references therein). Again, Lin et al. ignore the recent literature. In Cathaysia, the Triassic event is represented by scattered plutons and north- or northwest-verging folds. The authors argue that “an Indosinian aged orogen was situated to the south”. This assumption, already proposed (Faure et al., 2016), is likely, but nothing supports the

existence of Late Paleozoic ophiolites in southeast China. The Late Paleozoic rifting (Lin et al.'s figure 6E) does not comply with data. The entire Cathaysia was a single continent.

Terrane PT

In their model, Lin et al. invoke a “proposed terrane” (PT) that would be the southern upper plate of their collisional scenario, and “moved away after the orogeny” before amalgamation of East and West Cathaysia. The PT is a speculation required by the model but not documented. Such reasoning does not satisfy the scientific method in which a model must explain facts, and not the opposite. The PT assumption appears as an ad hoc explanation to set up a model based on missing facts.

In conclusion, the geology of South China is still incompletely understood, but any new model should fully take into account the existing background knowledge. It is therefore unfortunate that Lin et al. did not make use of all of the available data from this interesting area since, by not doing so, their proposed model does not improve the understanding of its complicated tectonic history.

REFERENCES CITED

- Charvet, J., Shu, L.S., Faure, M., Choulet, F., Wang, B., and Le Breton, N., 2010, Structural development of the Lower Paleozoic belt of South China: Genesis of an intracontinental orogen: *Journal of Asian Earth Sciences*, v. 39, p. 309–330, <https://doi.org/10.1016/j.jseas.2010.03.006>.
- Faure, M., Shu, L.S., Wang, B., Charvet, J., Choulet, F., and Monié, P., 2009, Intracontinental subduction: A possible mechanism for the Early Paleozoic Orogen of SE China: *Terra Nova*, v. 21, p. 360–368, <https://doi.org/10.1111/j.1365-3121.2009.00888.x>.
- Faure, M., Lin, W., Chu, Y., and Lepvrier, C., 2016, Triassic tectonics of the Southern margin of the South China Block: *Comptes Rendus Geoscience*, v. 348, p. 5–14, <https://doi.org/10.1016/j.crte.2015.06.012>.
- Li, Z.X., Li, X.H., Wartho, J.A., Clark, C., Li, W.X., Zhang, C.L., and Bao, C.M., 2010, Magmatic and metamorphic events during the early Paleozoic Wuyi-Yunkai orogeny, southeastern South China: New age constraints and pressure-temperature conditions: *Geological Society of America Bulletin*, v. 122, p. 772–793 <https://doi.org/10.1130/B30021.1>.
- Lin, S., Xing, G., Davis, D.W., Yin, C., Wu, M., Li, L., Jiang, Y., and Chen, Z., 2018, Appalachian-style multi-terrane Wilson cycle model for the assembly of South China: *Geology*, v. 46, <https://doi.org/10.1130/G39806.1>.
- Shu, L.S., Jahn, B.M., Charvet, J., Santosh, M., Wang, B., Xu, X.S., and Jiang, S.Y., 2014, Early Paleozoic depositional environment and intraplate tectonism in the Cathaysia Block (South China): Evidence from stratigraphic, structural, geochemical and geochronological investigations: *American Journal of Science*, v. 314, p. 154–186, <https://doi.org/10.2475/01.2014.05>.
- Shu, L.S., Wang, B., Cawood, P.A., Santosh, M., and Xu, Z., 2015, Early Paleozoic and Early Mesozoic intraplate tectonic and magmatic events in the Cathaysia Block, South China: *Tectonics*, v. 34, p. 1600–1621, <https://doi.org/10.1002/2015TC003835>.
- Wang, Y., Zhang, F., Fan, W., Zhang, G., Chen, S., Cawood, P.A., and Zhang, A., 2010, Tectonic setting of the South China Block in the early Paleozoic: Resolving intracontinental and ocean closure models from detrital zircon U-Pb geochronology: *Tectonics*, v. 29, TC6020, <https://doi.org/10.1029/2010TC002750>.
- Wang, Y.J., Fan, W., Zhang, G., and Zhang, Y., 2013, Phanerozoic tectonics of the South China Block: Key observations and controversies: *Gondwana Research*, v. 23, p. 1273–1305, <https://doi.org/10.1016/j.gr.2012.02.019>.
- Wei, W., Faure, M., Chen, Y., Ji, W., Lin, W., Wang, Q., Yan, Q., and Hou, Q., 2015, Back-thrusting response of continental collision: Early Cretaceous NW-directed thrusting in the Changle-Nan'ao belt (Southeast China): *Journal of Asian Earth Sciences*, v. 100, p. 98–114, <https://doi.org/10.1016/j.jseas.2015.01.005>.
- Xu, Y.J., Cawood, P., and Du, Y.S., 2016, Intraplate orogenesis in response to Gondwana assembly: Kwangsi Orogeny, South China: *American Journal of Science*, v. 316, p. 329–362, <https://doi.org/10.2475/04.2016.02>.