新疆南天山库尔干一带泥盆纪—早石炭世放射虫组合的发现

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提要:新疆南天山库尔干南阿尔腾柯斯组硅质岩地层中发现了丰富的保存良好的放射虫化石,共计 21 属 34 种,11 个未定种,1 个未定种属。研究表明,两个样品的放射虫组合时代分别为中—晚泥盆世和早石炭世。中—晚泥盆世放射虫组合的发现,丰富了库车地区泥盆纪放射虫生物群组合,为确定阿尔腾柯斯组的时代奠定了生物化石依据。结合前人对该组生物化石的研究,该组为跨时代岩石地层单元,应予解体。而具有早泥盆世—晚石炭世放射虫硅质岩的深水海相沉积地层为古南天山洋盆的演化过程提供了地层学证据。

关 键 词:新疆南天山;库尔干;硅质岩;放射虫组合;形成时代

中图分类号:Q915.811+.1 **文献标志码**:A **文章编号**:1000-3657(2007)04-0584-08

阿尔腾柯斯组是指分布于南天山哈尔克山南坡库勒湖断裂以南的一套深海相放射虫硅质岩、基性火山岩、碎屑岩夹碳酸盐岩沉积[1]。近年来,由于天山造山带研究的深入,对于该组地层时代和地层划分提出了不同的看法,1:20 万库勒幅地质报告❶中将这套地层划为中泥盆统萨阿尔明组,随后在 1:20 万黑英山幅地质报告❷中将该组改称为 S3-D1 阿尔腾柯斯组,王作勋等[2]、王宝瑜等[3]、王成源等[4]沿用了后一种划分方案。2004 年完成的 1:25 万喀赞其幅地质报告❸将该组划为下泥盆统阿尔腾柯斯组。地层时代认识的不同是因为缺乏生物化石依据和地层年代依据,该组晚泥盆—早石炭世放射虫已有报道[5],最近笔者在哈尔克山南坡库尔干一带发现中泥盆世放射虫组合,丰富和完善了该组生物化石组合,为该组地层时代的确定和南天山洋盆的演化历史提供了可信的古生物证据。

1 地质背景

天山位于中国新疆中部和吉尔吉斯斯坦和乌兹别克斯坦境内,呈近东西向展布,东西绵延约 2500 km,中国境内东西长约 1500 km。

天山位于欧亚大陆腹地,是介于西伯利亚地台和塔里木地台之间的一条晚古生代造山带[3,6-14],是中亚造山带的重要组成部分[15]。带内两条晚古生代缝合带——中天山南缘和北缘缝合带将天山造山带及邻区划分为准噶尔、伊犁和塔里木三大板块[11]。新疆南天山位于伊犁板块和塔里木板块之间(图 1),为中亚复合巨型缝合带的西南段[15]。南天山造山带内主要由古生代海相火山岩和沉积岩及其侵入其中的晚古生代岩浆岩组成,两条晚古生代蛇绿岩带[2,11]分布于其中。

研究区位于南天山库车河上游哈尔克山南坡,带内出露地层有:元古界兴地塔格岩群、阿克苏岩群;古生界奥陶系伊南里克组、志留系下统科克铁克达坂组、泥盆系下统阿尔腾柯斯组、石炭系下统野云沟组、石炭系中统阿依里河组、康克林组;中新生界阳霞组、齐古组、苏维依组及第四系(图 1)。

2 采样位置及剖面描述

本次在独库公路 975 km 处硅质岩中采样 2 个 (图 2),采样经纬度:D202-H1,N 42°20′14.8",E 83°15′19.3",H 1962 m;

收稿日期:2006-12-26;**改回日期**:2007-05-22

基金项目:国家自然科学基金项目(40272097)和中国石化股份公司油田事业部项目(WX2005-51)资助。

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❶新疆地质局区域地质调查大队. 1:20 万库勒幅地质图及说明书, 1975.

❷新疆地质局区域地质调查大队. 1:20 万黑英山幅地质图及说明书, 1983.

❸新疆维吾尔自治区地质调查院. 新疆 1:25 万喀赞其幅区域地质调查成果报告, 2004.

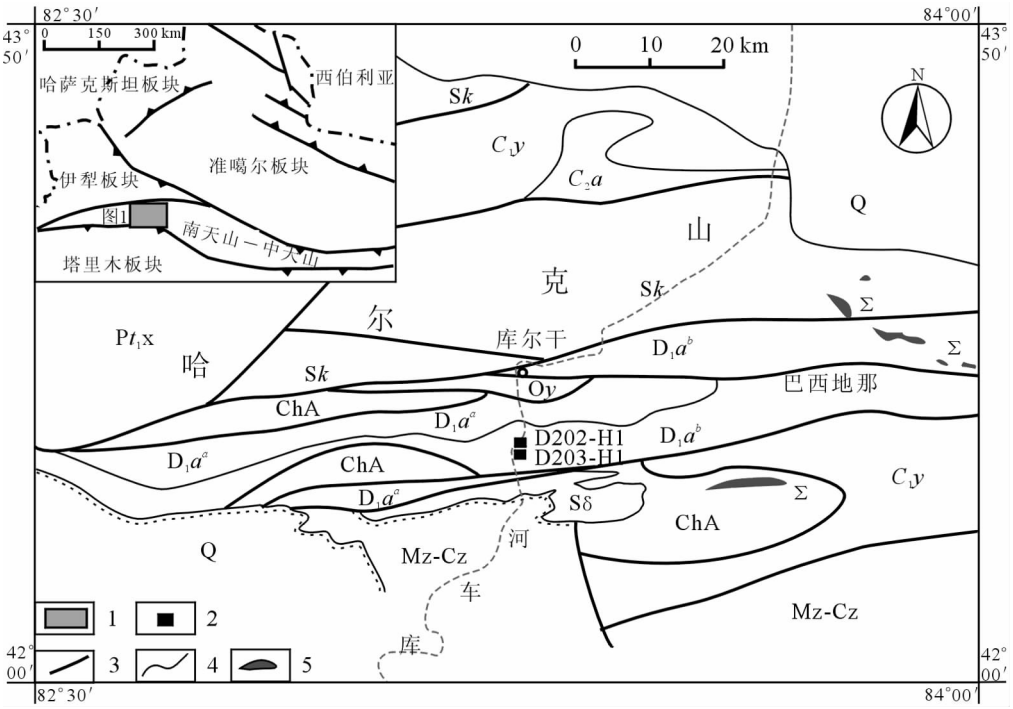


图 1　库车地区地质简图及采样位置(据 1:25 万喀赞其幅)

1—研究区位置;2—采样位置;3—断层;4—地质界线;5—超基性岩 Q—第四系;Mz-Cz—中、新生代;C_2a—石炭系中统阿依里河组;C_1y—石炭系下统野云沟组;D_1a—泥盆系下统阿尔腾柯斯组;S_3k—志留系下统科克铁克达坂组;$O\gamma$—奥陶系伊南里克组;ChA—长城系阿克苏岩群;Pt_1x—元古界兴地塔格岩群;$S\delta$—志留纪闪长岩;Σ—超基性岩

Fig.1　Geological sketch map of the Kuqa area, showing the samples location (modified from the 1:25 000 Kazanqi Sheet)

1-Location of the study area; 2-Sampling location; 3-Fault; 4-Geological boundary; 5-Ultrabasic rocks- Q-Quaternary; Mz-Cz-Meso-Cenozoic; C_2a-Middle Carboniferous Ayilihe Formation; C_1y-Lower Carboniferous Yeyungou Formation; D_1a-Lower Devonian Artengkesi Formation; S_3k-Lower Silurian Keketiekedaban Formation; $O\gamma$-Ordovician Yinanlik Formation; ChA-Changchengian Aksu Group-complex; Pt_1x-Proterozoic Xingditag Group-complex; $S\delta$-Silurian diorite; Σ-Ultrabasic rocks

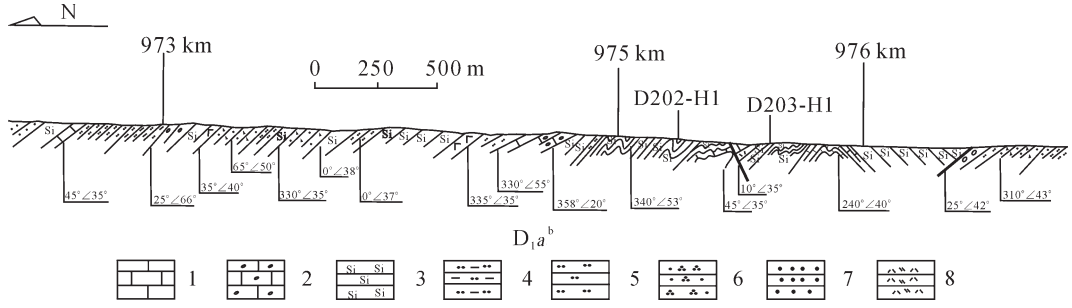


图 2　独库公路采样地质剖面

1—灰岩;2—碎裂灰岩;3—硅质岩;4—泥质粉砂岩;5—粉砂岩;6—石英砂岩;7—砂岩;8—火山碎屑岩

Fig.2　Geological section of samples along the Duzishan-Kuqa (Duku) Highway

1-Limestone; 2-Cataclastic limestone; 3-Chert; 4-Pelitic siltstone; 5-Siltstone; 6-Quartzose sandstone; 7-Sandstone; 8-Pyroclastic rocks

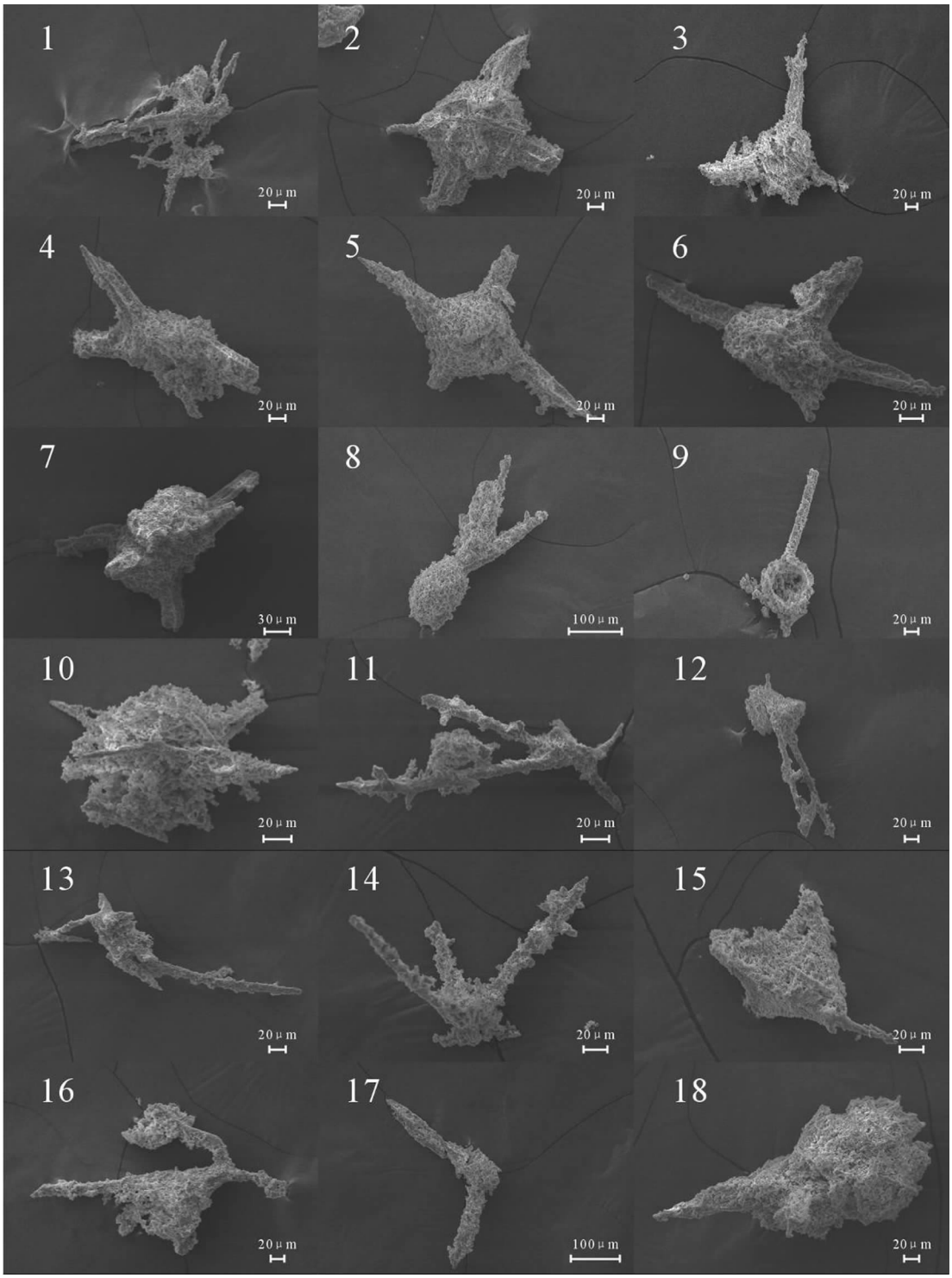
D203-H1, N 42° 20′02.3", E 83° 15′31.6"; H 1937 m。样品 D202-H1 为棕红色硅质岩,浅变质;D203-H1 为青灰色硅质岩。

采样位置位于库尔干南泥盆系下统阿尔腾柯斯组上段地层中,地层岩性主要为深灰色粉砂岩、粉砂质泥岩、岩屑长石砂岩、紫红色、深灰色薄层状硅质岩夹薄层灰岩、火山角砾岩及凝灰岩,该段地层发生倒转。

3　放射虫组合

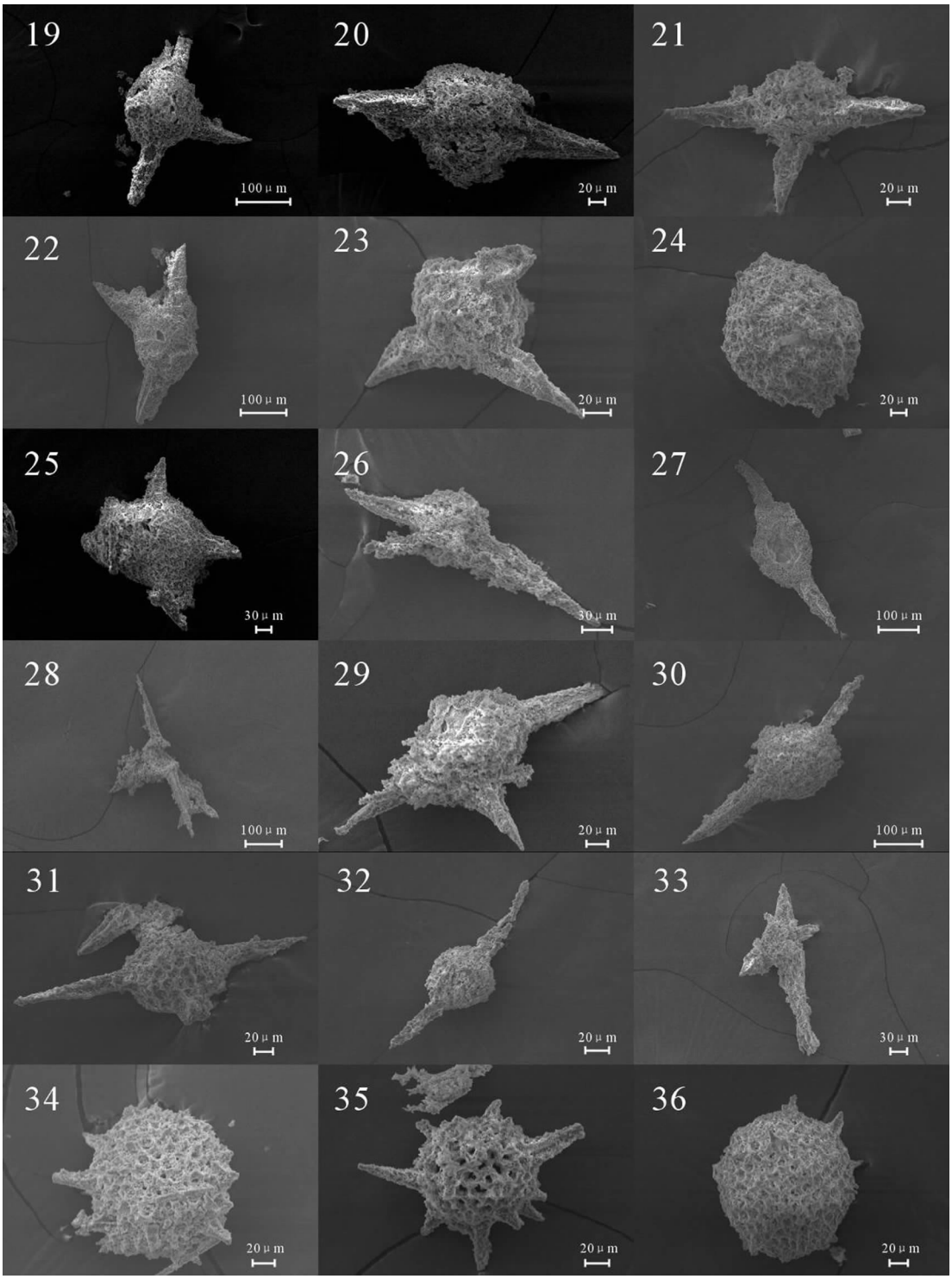
本次样品于 2006 年 7 月送往中国科学院地质与地球物理研究所微体古生物实验室鉴定,结果如下:

图版 I(Plate I)



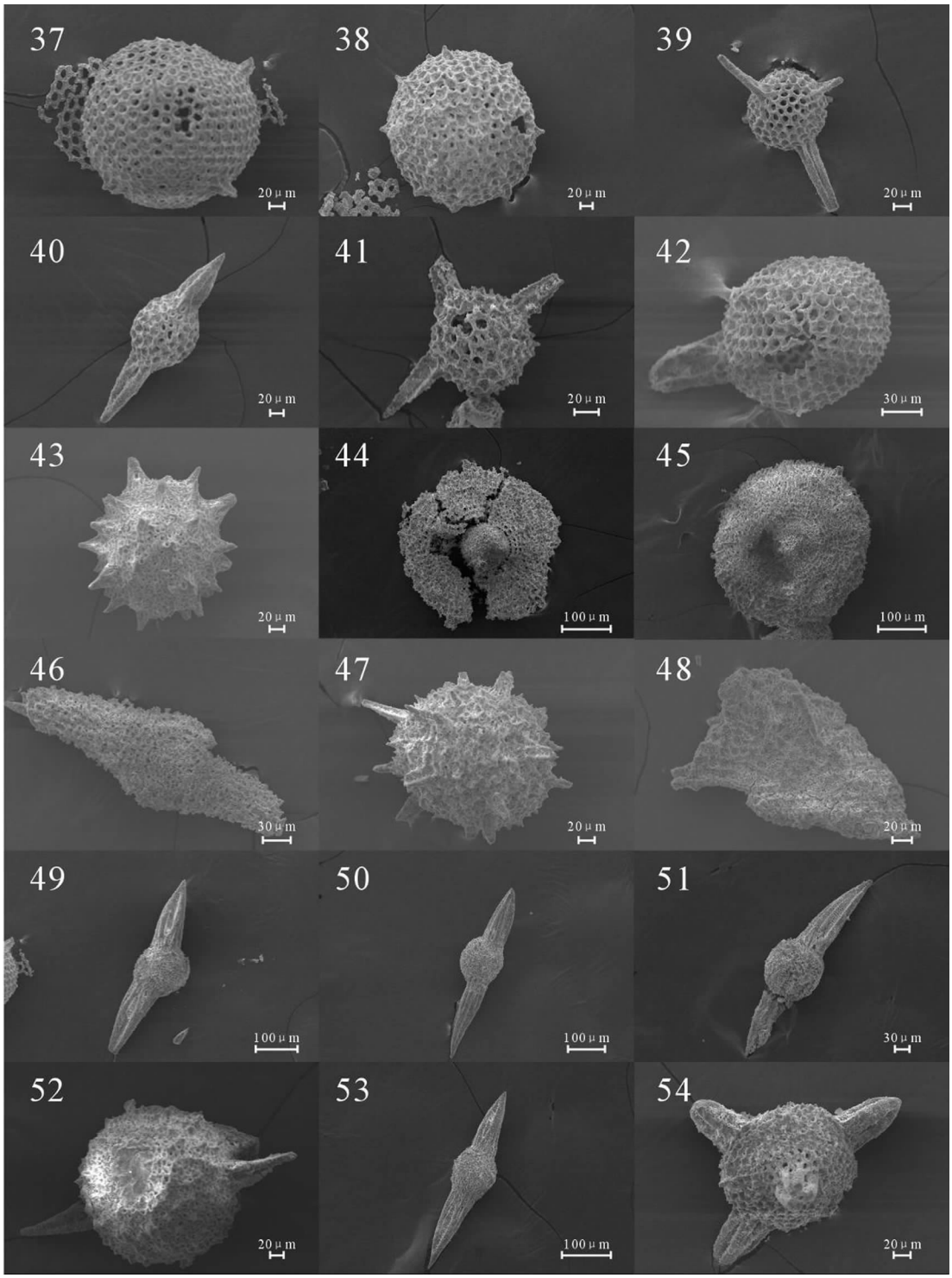
1−*Apophysiactinia* sp. cf. A. *testacea* Won (D202−H1);2−*Apophysisphaera*? sp. cf. *Trilonche davidi* (Hinde) (D202−H1);
3−*Apophysisphaera ornate* (Hinde) (D202−H1);4−*Apopysisphaera*? sp. A (D202−H1);5−*Apophysisphaera*? sp. B (D202−H1);
6−*Apophysisphaera*? sp. C (D202−H1);7−*Archocyrtium* sp. (D202−H1);8−*Archocyrtium*? sp. (D202−H1);9−*Entactinia* sp. cf. E. *hindeiana* Won (D202−H1);10−*Helioentactinia*? sp. (D202−H1);11−13−*Palaeoscenidium cladophorum* Deflandre (D202−H1);14−*Palaeoscenidium* sp. aff. P. *cladophorum Deflandre*; (D202−H1);15−*Palaeoscenidium planum* Won; (D202−H1);
16−*Palaeoscenidium* sp. A (D202−H1);17−*Polyentactinia miopora* Wang (D202−H1);
18−(left) *Pongentactinella* sp. cf. S. *corynacantha* Nazarov and Ormiston; (right) *Retisphaera* sp. (D202−H1)

图版 II (Plate II)



19−*Stigmosphaerostylus pusilla* (Hinde) (D202−H1);20−*Stigmosphaerostylus* sp. cf. S. *variabilis* (Ormiston and Lane) (D202−H1);
21−22−*Stigmosphaerostylus* sp. (D202−H1);23−*Triaenosphaera* sp. A (D202−H1);24−*Trilonche echinata* (Hinde) (D202−H1);
25−*Trilonche elegans* (Hinde) (D202−H1);26−27−*Trilonche pittmani* Hinde (D202−H1)28−32−*Trilonche vetusta* (Hinde)
(D202−H1);33−*Trilonche* sp. A (D202−H1);34−*Astroentactinia brilonensis* (Won) (D203−H1);
35−*Astroentactinia digitosa* Braun (D203−H1);36−*Astroentactinia multispinosa* (Won) (D203−H1)

图版 III(Plate III)



37−*Callella*(?) *hexactinia* Won (D202−H1)38−*Callella*(?) *parvispinosa* Won (D203−H1);39−*Entactinia*(?) *octaculeata* Won(D203−H1);40−*Entactinia variospina* (Won) (D203−H1)41−*Entactinia vulgaris* Won (D203−H1);42−*Entactinia* sp. cf. *Spongentactinella coryncantha* Nazarov and Ormiston (D203−H1);43−*Entactiniosphaera*(?) *trendalli* Won (D203−H1);
44−45−*Eostylodictya rota* (Won) (D203−H1);46−*Gedauia bibrachialis* Won (D203−H1);47−*Meschedea hirsute* Won (D203−H1);
48−*Popofskyellum companella* Won (D203−H1);79−51−*Stigmosphaerostylus variabilis* (Won) (D203−H1);
52−*Stigmosphaerostylus variabilis*(?) (Won) (D203−H1);53−*Stigmosphaerostylus* sp. cf. S. *variabilis* (Won) (D203−H1);
54−*Trienosphaera hebes* Won (D203−H1)

D202−H1 组合含放射虫:*Apophysiactinia* sp. cf. *A. testacea* Won (1);*Apophysisphaera*? sp. cf. *Trilonche davidi* (Hinde) (2);*Apophysisphaera ornate* (Won) (3);*Apopysisphaera?* sp. A (4);*Apophysisphaera?* sp. B (5);*Apophysisphaera?* sp. C (6);*Archocyrtium* sp. (7);*Archocyrtium?* sp. (8);*Entactinia* sp. cf. E. *hindeiana* Won (9);*Helioentactinia?* sp. (10);*Palaeoscenidium cladophorum* Deflandre (11 −13);*Palaeoscenidium* sp. aff. *P. cladophorum* Deflandre (14);*Palaeoscenidium planum* Won (15);*Palaeoscenidium* sp. A (16);*Polyentactinia miopora* Wang (17);*Retisphaera* sp. (18 右);*Pongentactinella* sp. cf. S. *corynacantha* Nazarov and Ormiston(18 左);*Stigmosphaerostylus pusilla* (Hinde) (19);*Stigmosphaerostylus* sp. cf. S. *variabilis* (Ormiston and Lane) (20);*Stigmosphaerostylus cubicus* Luo. Aitchison and Wang (21−22);*Triaenosphaera* sp. A (23);*Trilonche echinata* (Hinde) (24);*Trilonche elegans* (Hinde) (25);*Trilonche vetusta* (Hinde)(26−32);*Trilonche* sp. A (33);gen. and sp. indet. 。

D203−H1 组合含放射虫:*Astroentactinia brilonensis* (Won) (34);*Astroentactinia digitosa* Braun (35);*Astroentactinia multispinosa* (Won) (36);*Callella*(?) *hexactinia* Won (37);*Callella*(?) *parvispinosa* Won(38);*Cubaxonoim* (?) *octaedrospongiosum* Won; *Entactinia* (?) *octaculeata* Won (39);*Entactinia variospina* (Won) (40);*Entactinia vulgaris* Won (41);*Entactinia* sp. cf. *Spongentactinella coryncantha* Nazarov and Ormiston (42);*Entactiniosphaera* (?) *trendalli* Won (43);*Eostylodictya rota* (Won) (44 −45);*Gedauia bibrachialis* Won (46);*Meschedea hirsute* Won (47);*Popofskyellum companella* Won (48);*Stigmosphaerostylus variabilis* (Won)(49−51);*Stigmosphaerostylus variabilis* (?) (Won) (52);*Stigmosphaerostylus* sp. cf. S. *variabilis* (Won)(53)和 *Triaenosphaera hebes* Won (54), 另外含海绵骨针.

4　放射虫组合时代讨论

样品 D202−H1 共鉴定出 11 属;9 种,2 个亲近种,4 个相似种,10 个未定种,1 个未定种属。

D202−H1 中的已知属种中 *Trilonche* 属种最多,该属时代主要分布于早—晚泥盆世,在世界各地都有报道[16]。*Trilonche vetusta* (Hinde)(25−32)时代为早泥盆世—晚泥盆世弗拉斯期和法门期[16−18],在澳大利亚东部新英格兰造山带、俄罗斯南乌拉尔,中国广西东南部、云南回库和太尔布(弗拉斯阶),法国沃斯格斯和德国 Frankenwald (法门阶) 均有分布;*Trilonche echinata* (Hinde)(24),时代为中泥盆世吉维特至晚泥盆世法门期[16−18],见于澳大利亚东部新英格兰造山带和中国云南晒经坡(吉维特阶)、俄罗斯南乌拉尔、澳大利亚西部 Gogo 盆地,中国广西板城(弗拉斯阶)、北美俄亥俄州、中国云南南雅和新疆欧姆哈(法门阶)。其次,*Trilonche elegans* (Hinde) (25)时代为中泥盆世吉维特阶—晚泥盆世[17],分布于澳大利亚东部,美国、德国,在中国云南见于中泥盆世吉维特阶地层中。*Stigmosphaerostylus cubicus* Luo. Aitchison and Wang (21−22)时代为早—中泥盆世,在广西南宁可见[16]。*Stigmosphaerostylus pusilla* (Hinde)(19)时代为中—晚泥盆世[17−18],分布于德国、澳大利亚和俄罗斯、泰国,在中国云南亦有分布。只有 *Palaeoscenidium cladophorum* Deflandre(11 −13)和 *Palaeoscenidium planum* Won[19](15)的时限长,从中泥盆世—早石炭世在世界各地均有发现。根据该组合发现种属综合分析,这个组合时代应为中—晚泥盆世。

样品 D203−H1 共鉴定出 10 个属,16 种,2 个相似种。D203−H1 组合中已知属种中的绝大部分成员均可和欧洲的早石炭世、早维宪期 upper *Albaillellaindensis* Zone[20]和澳大利亚 *A. indensis*−*A. furcata* 放射虫组合带[21]相对比,其中,*Triaenosphaera hebes* Won (54),*Entactinia vulgaris* Won (41),*Astroentactinia multispinosa* (Won) (36),*Entactinia variospina* (Won) (40),*Entactiniosphaera* (?) *trendalli* Won (43),*Popofskyellum companella* Won (48) 均为早石炭世的分子;除了 *Stigmosphaerostylus variabilis* (49−51) 的时限在泰国从中泥盆世—早石炭世都有发现,*Spongentactinella coryncantha*(42)在晚泥盆世–早石炭世在北美有所发现,因此,该组合的时限为早石炭世维宪早期(upper *Albaillellaindensis* Zone)。

5　地质意义

本次笔者在库车河 975~976 km 处发现的中泥盆世、早石炭世放射虫化石组合为前人[2−4]所界定的早泥盆世阿尔腾柯斯组地层时代的讨论提供了可靠的生物化石依据。结合前人在该组发现的早泥盆世、晚泥盆—早石炭世微体古生物化石资料[3,5,22],认为阿尔腾柯斯组包括了从早泥盆世—晚石炭世的生物化石,其在沉积上表现为连续的海相沉积环境,时间上具有很大的跨度,为一跨时代地层单位,考虑可以解体。

阿尔腾柯斯组时代的确定为南天山洋的演化历史提供了重要的地层依据。分布于南天山古生代地层之上的南北两支蛇绿岩 (北支沿长阿吾子—科克苏河—达鲁巴依—古洛河—榆树沟—铜花山—硫磺山一带展布; 南支西起中吉边界的阿文库、经米斯布拉克、阿尔腾柯斯河中游、库勒湖—铁力买提大阪—科克铁克大阪和独库公路欧西大阪至色日科牙依拉克)带代表的同一古南天山洋盆[11]在晚前寒武—早古生代已经形成[12,14,23−27],在南天山哈尔克山一带出露的志留纪—泥盆纪—早石炭世持续发育的海相深水硅质岩地层证实了该洋盆自志留纪以来的持续演化过程, 该洋盆至少延续到早石炭世维宪期。

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Discovery of a Devonian–Lower Carboniferous radiolarian assemblage in the Korgan area, South Tianshan Mountains

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Abstract: Abundant well-preserved radiolarians were discovered in cherts in the Artengkesi Formation south of Korgan, South Tianshan, Xinjiang. They comprise 21 genera and 46 species, of which eleven are indefinite species and one is indefinite genus. Study indicates that the radiolarian assemblages of two samples are Middle-Late Devonian and Early Carboniferous in age. The discovery of the Middle-Late Devonian radiolarian assemblage enriches the Devonian radiolarian fauna in the Kuqa area and provides fossil evidence for the determination of the age of the Artengkesi Formation. On that basis, combined with previous studies of fossils in this formation, the authors think that this formation is an age-straddling lithostratigraphic unit and should be disintegrated into the lower, Middle and Upper Devonian stratigraphic units. The abyssal sediments containing Early Devonian-Late Carboniferous radiolarian cherts provide stratigraphic evidence for the evolution of the South Tianshan paleo-ocean basin.

Key words: South Tianshan Mountains; Xinjiang; Korgan; chert; radiolarian assemblage; age

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