

Compression Analysis on Different Prediction Modes and Quantization for Satellogic Data Set

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Table Color Legend:

- **Cyan:** best column
- **Pink:** best V2F

Table 1: Pixel

A	B	C	D
E	F	G	H
I	J	[X]	-

1 Compression Analysis $q=1$

1.1 Boats2020

Table 2: Boats2020 $q = 1$ Compressed Bit Rate (bpppc)

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	5.9702	3.3970	3.5343	3.3966	3.3008	3.1591	3.3893	3.2044	3.1640	3.3123
Zstandard	3.6776	3.3257	3.6026	3.4851	3.2890	3.2381	3.3516	3.2589	3.2507	3.3019
JPEG-LS	2.9577	3.6449	3.7248	3.6450	3.6073	3.4473	3.5815	3.4412	3.4479	3.4886
Kakadu	2.9997	3.6504	3.7587	3.6456	3.6106	3.4469	3.5779	3.4484	3.4501	3.4995
CCSDS 123	2.9025	3.4638	3.5467	3.4503	3.4024	3.2360	3.3871	3.2303	3.2285	3.2910
BZIP2	3.3501	3.3910	3.5996	3.4832	3.3797	3.2788	3.3931	3.2831	3.2844	3.3071
LZ77Huff	4.1897	3.6669	3.8519	3.7327	3.6202	3.5183	3.6952	3.5537	3.5318	3.6063
LZMA	3.5508	3.3104	3.5495	3.4375	3.3139	3.1948	3.3445	3.2219	3.2083	3.2706
V2F	-	3.6617	3.8320	3.6423	3.5055	3.3749	3.7196	3.4960	3.4090	3.6393

Table 3: Boats2020 $q = 1$ Compression Efficiency 1byte Entropy

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	5.9702	3.3970	3.5343	3.3966	3.3008	3.1591	3.3893	3.2044	3.1640	3.3123
Zstandard	1.6313	1.0233	0.9798	0.9738	1.0038	0.9757	1.0110	0.9820	0.9727	1.0010
JPEG-LS	2.0213	0.9306	0.9469	0.9307	0.9145	0.9154	0.9433	0.9288	0.9160	0.9464
Kakadu	1.9946	0.9295	0.9387	0.9308	0.9138	0.9156	0.9447	0.9272	0.9157	0.9438
CCSDS 123	2.0612	0.9799	0.9954	0.9839	0.9700	0.9756	0.9983	0.9902	0.9789	1.0041
BZIP2	1.7887	1.0033	0.9803	0.9741	0.9771	0.9631	0.9972	0.9740	0.9622	0.9986
LZ77Huff	1.4332	0.9264	0.9160	0.9089	0.9116	0.8972	0.9153	0.8998	0.8946	0.9158
LZMA	1.6899	1.0277	0.9945	0.9873	0.9963	0.9886	1.0128	0.9933	0.9855	1.0106
V2F	-	0.9316	0.9267	0.9353	0.9434	0.9387	0.9189	0.9225	0.9318	0.9173

Table 4: Boats2020 $q = 1$ Compression Time (seconds)

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	5.9702	3.3970	3.5343	3.3966	3.3008	3.1591	3.3893	3.2044	3.1640	3.3123
Zstandard	27.8817	34.3433	34.9150	35.0175	35.5342	36.0067	34.0092	34.9675	35.2417	35.7983
JPEG-LS	5.9075	6.5117	6.4283	6.2742	6.3558	6.5292	6.5175	6.2242	6.4908	6.4742
Kakadu	2.0217	2.4117	2.5483	2.4775	2.4508	2.3883	2.4442	2.3475	2.3192	2.5325
CCSDS 123	9.1453	9.3729	9.1014	9.2144	9.3816	9.0171	9.5062	9.4787	9.3575	10.6457
BZIP2	4.2672	4.0109	4.0852	4.0667	4.0618	4.2026	4.1341	4.9463	4.6297	4.7750
LZ77Huff	2.1728	2.3694	2.3700	2.4283	2.5356	2.3625	2.3540	2.3519	2.4750	2.6978
LZMA	30.9000	36.9216	36.3493	37.6492	38.0748	38.6318	37.4073	38.5462	38.9990	44.7962
V2F	-	1.5650	1.5925	1.7233	1.6442	1.7225	1.6300	1.6650	1.7050	1.7883

1.2 Fields2020

Table 5: Fields2020 $q = 1$ Compressed Bit Rate (bpppc)

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	6.1801	3.3400	3.4393	3.3801	3.3369	3.1467	3.2275	3.0942	3.1120	3.1604
Zstandard	3.5813	3.2497	3.5368	3.4786	3.3110	3.2344	3.2153	3.1994	3.2209	3.2246
JPEG-LS	2.9905	3.6405	3.7088	3.6588	3.6404	3.4821	3.5581	3.4447	3.4703	3.4766
Kakadu	3.0169	3.6495	3.7425	3.6666	3.6578	3.4698	3.5313	3.4221	3.4518	3.4555
CCSDS 123	2.9094	3.4642	3.5252	3.4738	3.4607	3.2633	3.3409	3.2013	3.2326	3.2410
BZIP2	3.3040	3.2993	3.5534	3.5009	3.3711	3.2563	3.2998	3.2285	3.2517	3.2462
LZ77Huff	3.9753	3.5792	3.7773	3.7259	3.6297	3.4921	3.5641	3.4670	3.4835	3.4957
LZMA	3.4856	3.2590	3.5022	3.4495	3.3419	3.1940	3.2455	3.1611	3.1840	3.1893
V2F	-	3.5233	3.6315	3.5671	3.5134	3.3110	3.4073	3.2710	3.2830	3.3436

Table 6: Fields2020 $q = 1$ Compression Efficiency 1byte Entropy

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	6.1801	3.3400	3.4393	3.3801	3.3369	3.1467	3.2275	3.0942	3.1120	3.1604
Zstandard	1.7276	1.0278	0.9721	0.9715	1.0078	0.9728	1.0034	0.9666	0.9659	0.9794
JPEG-LS	2.0670	0.9171	0.9269	0.9235	0.9165	0.9034	0.9064	0.8977	0.8964	0.9083
Kakadu	2.0490	0.9149	0.9185	0.9216	0.9122	0.9066	0.9133	0.9036	0.9012	0.9139
CCSDS 123	2.1250	0.9638	0.9752	0.9728	0.9642	0.9641	0.9653	0.9660	0.9624	0.9744
BZIP2	1.8722	1.0124	0.9674	0.9652	0.9899	0.9662	0.9775	0.9578	0.9567	0.9728
LZ77Huff	1.5569	0.9330	0.9101	0.9069	0.9193	0.9009	0.9050	0.8920	0.8930	0.9034
LZMA	1.7749	1.0249	0.9816	0.9796	0.9985	0.9850	0.9940	0.9783	0.9771	0.9902
V2F	-	0.9490	0.9484	0.9484	0.9501	0.9511	0.9493	0.9477	0.9490	0.9474

Table 7: Fields2020 $q = 1$ Compression Time (seconds)

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	6.1801	3.3400	3.4393	3.3801	3.3369	3.1467	3.2275	3.0942	3.1120	3.1604
Zstandard	26.2111	35.9265	35.2577	35.5388	36.4244	36.7668	35.9277	36.4346	36.5199	36.2198
JPEG-LS	6.1570	6.3862	6.3169	6.2806	6.3036	6.4496	6.4591	6.4075	6.4487	6.4278
Kakadu	2.0187	2.4783	2.5661	2.5009	2.4888	2.3780	2.4046	2.3397	2.3627	2.3766
CCSDS 123	9.1028	9.1344	9.2491	9.0351	9.0665	8.9847	9.1144	9.3124	9.1670	9.2192
BZIP2	4.3391	4.0198	4.1457	4.1383	4.5615	4.2262	3.9332	4.0009	4.4417	4.5325
LZ77Huff	2.1086	2.4371	2.4608	2.4781	2.4936	2.4551	2.4297	2.4223	2.4804	2.4089
LZMA	28.7274	38.3881	37.2425	38.1793	38.9418	39.0158	38.9408	39.1087	39.2343	39.2682
V2F	-	1.5160	1.6644	1.7230	1.6591	1.6813	1.6219	1.6829	1.7185	1.7274

1.3 Full Dataset

Table 8: Full Dataset $q = 1$ Compressed Bit Rate (bpppc)

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	6.1654	3.3439	3.4459	3.3813	3.3344	3.1476	3.2388	3.1019	3.1156	3.1710
Zstandard	3.5880	3.2550	3.5414	3.4790	3.3095	3.2346	3.2248	3.2035	3.2230	3.2300
JPEG-LS	2.9882	3.6408	3.7099	3.6579	3.6381	3.4797	3.5597	3.4445	3.4687	3.4775
Kakadu	3.0157	3.6495	3.7437	3.6652	3.6545	3.4682	3.5346	3.4239	3.4517	3.4586
CCSDS 123	2.9089	3.4642	3.5267	3.4722	3.4567	3.2614	3.3441	3.2034	3.2323	3.2445
BZIP2	3.3072	3.3057	3.5566	3.4996	3.3717	3.2579	3.3063	3.2323	3.2540	3.2504
LZ77Huff	3.9902	3.5853	3.7825	3.7263	3.6290	3.4940	3.5732	3.4731	3.4868	3.5034
LZMA	3.4901	3.2626	3.5055	3.4487	3.3400	3.1941	3.2524	3.1654	3.1857	3.1950
V2F	-	3.5330	3.6455	3.5723	3.5129	3.3155	3.4290	3.2867	3.2918	3.3642

Table 9: Full Dataset $q = 1$ Compression Efficiency 1byte Entropy

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	6.1654	3.3439	3.4459	3.3813	3.3344	3.1476	3.2388	3.1019	3.1156	3.1710
Zstandard	1.7209	1.0275	0.9726	0.9716	1.0075	0.9730	1.0039	0.9677	0.9664	0.9809
JPEG-LS	2.0638	0.9181	0.9283	0.9240	0.9164	0.9043	0.9090	0.8999	0.8978	0.9110
Kakadu	2.0452	0.9159	0.9199	0.9222	0.9123	0.9073	0.9155	0.9053	0.9022	0.9159
CCSDS 123	2.1205	0.9650	0.9766	0.9735	0.9646	0.9649	0.9676	0.9677	0.9635	0.9765
BZIP2	1.8663	1.0117	0.9683	0.9658	0.9890	0.9659	0.9789	0.9590	0.9571	0.9746
LZ77Huff	1.5483	0.9326	0.9105	0.9071	0.9188	0.9006	0.9057	0.8925	0.8932	0.9043
LZMA	1.7690	1.0251	0.9825	0.9801	0.9983	0.9853	0.9953	0.9794	0.9777	0.9917
V2F	-	0.9477	0.9469	0.9475	0.9496	0.9503	0.9472	0.9459	0.9478	0.9453

Table 10: Full Dataset $q = 1$ Compression Time (seconds)

Codec	original	W	NW	N	JLS	JG	IJ	FGJI	FGJ	FGHI
Entropy	6.1654	3.3439	3.4459	3.3813	3.3344	3.1476	3.2388	3.1019	3.1156	3.1710
Zstandard	26.3277	35.8160	35.2338	35.5024	36.3623	36.7138	35.7938	36.3322	36.4307	36.1904
JPEG-LS	6.1396	6.3950	6.3247	6.2802	6.3073	6.4551	6.4632	6.3947	6.4516	6.4310
Kakadu	2.0190	2.4736	2.5648	2.4993	2.4862	2.3787	2.4073	2.3402	2.3597	2.3875
CCSDS 123	9.1058	9.1511	9.2388	9.0476	9.0885	8.9869	9.1417	9.3240	9.1803	9.3187
BZIP2	4.3341	4.0192	4.1415	4.1333	4.5266	4.2245	3.9472	4.0668	4.4548	4.5494
LZ77Huff	2.1131	2.4324	2.4545	2.4746	2.4965	2.4486	2.4244	2.4174	2.4800	2.4290
LZMA	28.8790	38.2858	37.1802	38.1423	38.8814	38.9890	38.8338	39.0694	39.2179	39.6539
V2F	-	1.5194	1.6594	1.7230	1.6580	1.6842	1.6224	1.6817	1.7176	1.7317